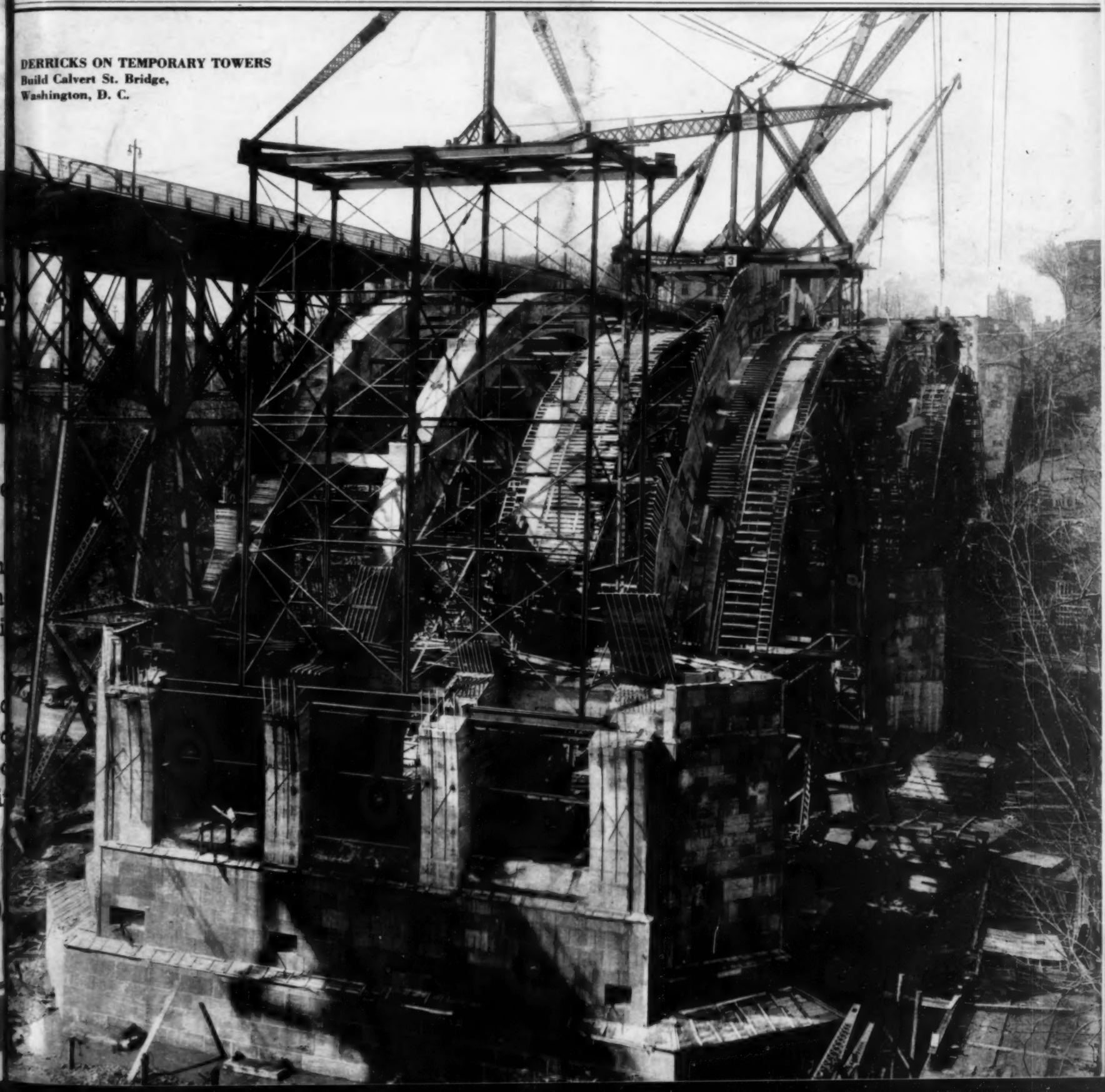
Construction Methods

McGraw-Hill Publishing Company, Inc.

December, 1935

Price 20 Cents



DERRICKS ON TEMPORARY TOWERS
Build Calvert St. Bridge, Washington, D. C.

Construction Methods

McGraw-Hill Publishing Company, Inc.,
330 West 42nd St., New York

ROBERT K. TOMLIN, Editor

DECEMBER, 1935

WILLARD CHEVALIER, Vice-President

Editorial Staff: Vincent B. Smith, N. A. Bowers (San Francisco)
Leonard H. Church (Cleveland). Nelle Fitzgerald

Taking Stock of the Works Program

● In the work relief program as it exists today there is no more evidence of definite policy or planning than there was last January when President Roosevelt assured Congress that $4,000,000,000, the largest peace-time appropriation in history, would be expended in creating employment for 3,500,000 men on useful public works. Since then it appears that the term "useful public works" is susceptible of as many and conflicting interpretations as "adequate but sound currency."

Pressed by Congress for some idea of the nature of the projected works program that he had in mind, the President set up a schedule of allocations so broad that it had no real significance, as was subsequently revealed. Of primary interest was the allocation of $900,000,000 for grants and loans to states and their political subdivisions that later was increased to $1,700,000,000 by the President. This was apparent assurance that a considerable proportion of the funds appropriated by Congress would be spent for an extensive program of non-federal public works.

Made Work Favored

● In the meantime, however, the President had created the Works Progress Administration, with Harry Hopkins in charge, to "recommend and carry on all useful projects designed to assure a maximum of employment in all localities." The practical result of this delegation of authority to Hopkins was to subordinate projects scheduled by PWA to a vast, impalpable program of "made work." PWA was further handicapped by limitations on man-year cost and the requirement that 90 per cent of all labor employed must be drawn from relief rolls.

Hundreds of PWA projects were rejected by WPA as not eligible for funds, while WPA sought to fatten its own program with projects that, regarded from both engineering and financial standpoints, should have been set up on the 45 per cent grant-55 per cent loan basis established for PWA's program. This conflict presumably was settled by the President's decision that WPA was to confine itself to projects not exceeding $25,000 in cost.

Such action, however, apparently has failed to bind WPA's policy and did not, at any rate, determine how the $1,700,000,000 available for public improvements in state, town and county would be divided between WPA and PWA. Administrator Ickes finally appealed to the President after he had seen most of his projects thrown overboard by WPA, with the result that PWA has been allotted $331,349,589 which has been distributed as grants covering 45 per cent of the cost of 3,835 projects, while WPA allotments reached a total of $1,067,492,836 (as of Nov. 16) to be spent as state WPA administrators see fit on projects selected from an approved list totaling $3,795,442,948.

Elderman, in the Washington Post

"The Work Relief Program . . . . Has Moved More Slowly Than I Hoped"—F.D.R.

Labor Regulations

● Defeated in Congress in its fight for the prevailing wage, organized labor never let up in its bombardment against WPA monthly wage schedules. Hopkins refused to budge, but finally permitted state administrators to ignore the previously established minimum of 120 hr. a month, with the result that hourly rates in many localities have been raised considerably, even though there is no more money in the worker's pay envelope.

PWA had no trouble in this connection, as prevailing wage rates apply on all of its projects. The requirement that 90 per cent of labor be employed from relief rolls cracked under the strain and Hopkins finally ruled that on contract jobs (which are practically all confined to PWA), when contractors desire organized labor, the agencies of the U. S. Employment Service shall furnish employees from lists supplied by the unions, giving preference, first, to regular employees of the contractor on relief rolls; second, to other union members on relief rolls; and, third, to union men not on relief rolls.

Hopkins likewise discovered that the WPA program could not be carried on under the restrictions with respect to employment of labor and state administrators were advised Nov. 9 that the wages of 10 per cent of the total number of workers employed in their respective states may exceed the established schedule of monthly earnings in the hope that this "makes it possible for every state administrator to work out his employment program with full flexibility in the selection and placement of workers under any labor conditions that may exist."

It is impossible to delineate all the ramifications of the works program in which executive direction has floundered before realizing that procedures and requirements established in Washington necessarily must yield to actual conditions prevailing in the field. Seven months have passed while WPA has been groping towards the light. Because of the long delay, $817,000,000 of the $4,000,000,000 works appropriation has been dissipated in continuing grants to the states for direct relief.

Realizing late in August that the works program had bogged down, President Roosevelt sought to recover lost ground by fixing a series of dates by which the program shall have passed a given point. The last is Dec. 15, by which date all contracts must be awarded, except for municipal power projects. Unable to meet this deadline, the sponsors of many PWA projects will lose their allotments. Many cities have discovered that bids are running so high that they will be forced either to abandon their projects or, as suggested by Administrator Ickes, shift from a 45 to a 30 per cent grant basis in order to reduce the man-year cost chargeable to the federal government's contribution.

WPA'S Program

● In WPA, the situation is largely the result of internal confusion, coupled with the difficulty of adapting itself to meet conditions out in the states. WPA state works programs, set up for speed, have not shown any greater acceleration than PWA's program. They cannot be condemned, however, as wholesale boondoggling. Indeed, WPA includes a large number of projects that properly should be financed either through PWA or the city's own budget. WPA projects vary widely in character. Roads constitute 43.7 per cent of allotments, followed in order by sewers and water mains, 11.5 per cent; schools and other public buildings, 8.4 per cent; parks and other recreation facilities 8.3 per cent; conservation and reforestation 4.8 per cent, reclamation and flood control, 4.1 per cent; and bridge and viaduct construction 1.1 per cent. White collar projects account for 3.6 per cent of the total and the remainder is a potpourri of miscellaneous work.

Employment Short of Goal

● What has happened to the present works program since Congress passed the $4,000,000,000 appropriation last April is epitomized in the fact that only 70 per cent of the total has been actually allotted for works projects of any description, while employment, still striving towards a goal of 3,500,000 by Dec. 1, totaled 1,737,610 on Nov. 2, the date of the last report, including an enrollment of 535,717 in the Civilian Conservation Corps which was a going concern before the work-relief program was conceived.

NEXT MONTH—*Road Builders' Number*

The January, 1936, issue of *Construction Methods* will be the Annual Road Builders' Number appearing on the eve of the Convention and Road Show at Cleveland, Jan. 20-24, of the American Road Builders' Association. It will feature new developments in method and equipment for highway construction.

Count the *Indirect* Costs

ONE of the chief risks inherent in any emergency expedient is the tendency to overlook its secondary effects and indirect costs. An object lesson in such excessive preoccupation with an immediate objective is found in many aspects of the WPA program. One illuminating case is the removal of the abandoned street-car tracks on Madison Avenue in New York City.

Here was a job that fitted closely the specifications laid down by the President in his public works policy. The removal of the tracks, rendered obsolete by the use of buses, would speed up traffic, remove a hazard and thereby enable Madison Avenue to relieve other congested routes. With many construction workers unemployed, here was a chance to put them to work on a job of genuine community benefit.

Many citizens will assume that the cost of doing this work is covered by the payments made to the workers. The fact is, of course, that those payments were but a part of the cost. The total cost of such a job cannot be reckoned without the secondary and indirect costs of which some of the people now are becoming painfully conscious.

The section between 42nd and 59th streets was done by methods which did accomplish results at reasonable total cost. It was done by contract, by modern methods. It was opened to traffic in less than eight weeks to the great advantage of those who used it, those who did business along its length and to the community as a whole through the relief of congestion elsewhere. Through private industry and business it created normal employment for competent men who needed the jobs, not alone at the site of the work but also in the production, merchandising and transportation of materials and equipment used.

ON the other hand, the stretch from 59th to 82nd streets was undertaken by the characteristic WPA method of pouring into the job as much hand labor as possible. Here is no occasion to comment on the inefficiency of those thus put on the public payroll, although that is what stirs the resentment of the average citizen as he watches the job. The point here to be considered is the enormous indirect cost of this project to the community. Begun July 26th, the job has kept twenty-three blocks of that important avenue torn up for more than four months. It is barely possible that it may be done by Christmas but it is just as likely that present conditions may prevail until after the first of the year. Winter weather will not increase the efficiency of primitive methods.

During all this time a vast toll of hidden costs is being paid by every motorist that uses the avenue, every owner of adjoining property, every shop-keeper who relies on it for access to his place of business and many thousands more who cannot be classified. Moreover, this throttling of traffic capacity has materially reduced the usefulness of the improvement already completed at the lower end. On many such counts the bill for this job will run far beyond the actual cash disbursed through WPA payrolls.

How much in dollars? No one knows. Such costs are intangible, invisible, incalculable. But they are none the less real: they are part of the price we must pay whenever, in our modern industrial economy, we revert to primitive methods at some one point in the cycle in order to deal with an emergency.

ALL over the country today like wastes are accumulating on other jobs. Although the people cannot measure them, they are becoming conscious of them. They are becoming irritated, resentful and critical, without being able to put their fingers precisely on the reason why. But their instinct tells them that something is wrong, and their instinct is right.

Before we are through with the WPA undertaking, the people will become more and more conscious of the difference between a sound public works program, designed to use private enterprise and normal methods in maintaining a consistent program of useful public improvement, and this alien scheme of using public improvements as a social expedient to multiply jobs for all those who are unable to find them in their normal occupations.

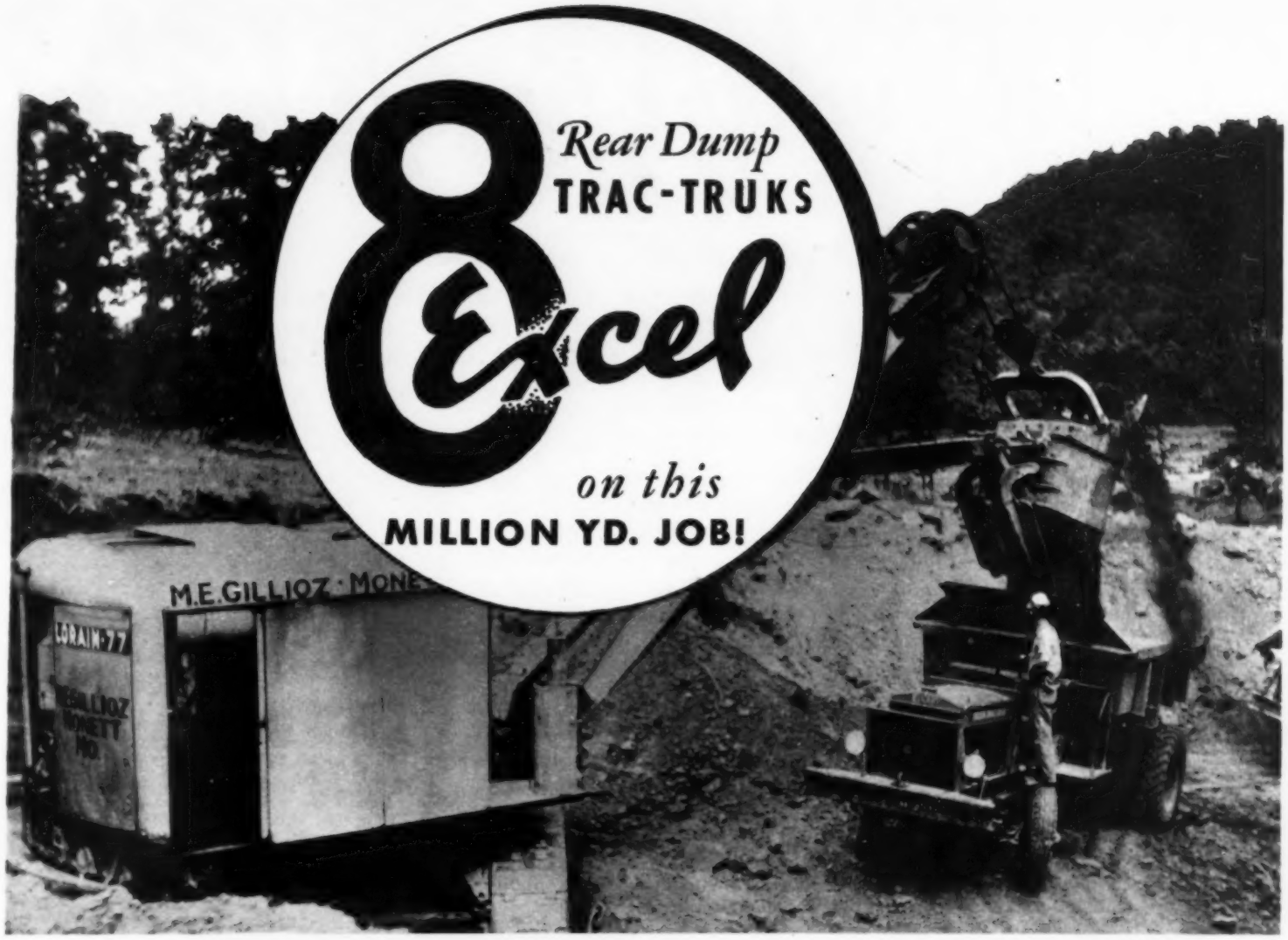
A public works program is a device that is wholly in keeping with our economic system. The work-relief effort violates the basic principles of that system. It reverts to the primitive at one point in a cycle, and thereby disrupts badly the operation of that cycle at many other points. While the indirect costs of this expedient cannot be measured in dollars and cents, they are none the less real and will constitute an important part of the price that the American people must pay for its use.

Willard Chevalier

CONSTRUCTION METHODS. December, 1935. Volume 17, Number 12. Published Monthly, price 20¢ a copy. Subscription rates—United States, Mexico and Central and South American countries, $2.00 a year. Canada, including duty, $2.50 a year. All other countries, $4.00 a year or 16 shillings. Entered as second class matter October, 1926, at Post Office at New York, N. Y., under the act of March 3rd, 1879. Printed in U.S.A. Cable address "McGrawhill, New York." Member of A.B.P. Member of A.B.C.

McGRAW-HILL PUBLISHING COMPANY, INC., 330 WEST 42d STREET, NEW YORK, N. Y.

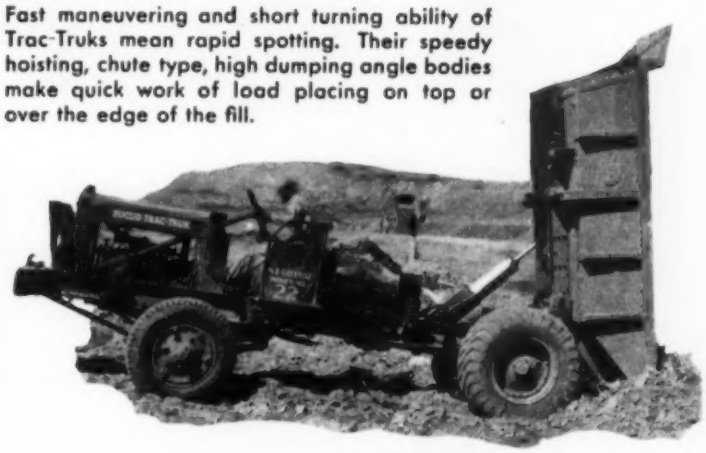
Editorial and Publishing Offices: 330 West 42d St., New York; 520 North Michigan Ave., Chicago; 883 Mission St., San Francisco; Aldwych House, London, W. C. 2, England. Branch Offices: Washington; Philadelphia; Cleveland; Detroit; St. Louis; Boston; Atlanta, Ga. James H. McGraw, Chairman of the Board; Malcolm Muir, President; James H. McGraw, Jr., Executive Vice-President; Willard Chevalier, Vice-President; B. R. Putnam, Treasurer; D. C. McGraw, Secretary.



Better operation—more production hourly and daily . . . with the resultant lowering of costs per yard.

These are the pleasing facts—*determined by actual cost records made*—that account for the enthusiasm of this big contractor in praising Trac-Trucks for their work on the Clear Creek Dam Project near Fort Smith, Arkansas. They excel in ruggedness—traction on grades and over soft footing—short turning—greater power in higher speeds—dumping time and placing of load.

Fast maneuvering and short turning ability of Trac-Truks mean rapid spotting. Their speedy hoisting, chute type, high dumping angle bodies make quick work of load placing on top or over the edge of the fill.



The
EUCLID ROAD MACHINERY CO.
★
CLEVELAND OHIO

On jobs where time is money

Contractors Are Saving Both by Using G-E Motors and Control

ON important construction jobs, time is truly money. The sooner the job is completed, the greater are the profits. Delays are costly.

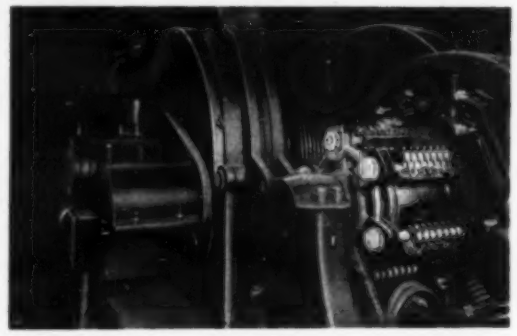
It is on jobs like these that General Electric equipment is daily proving itself a valuable time- and money-saving investment for contractors.

For example, G-E motors and control for cranes, hoists, and cableways give contractors these three major operating advantages:

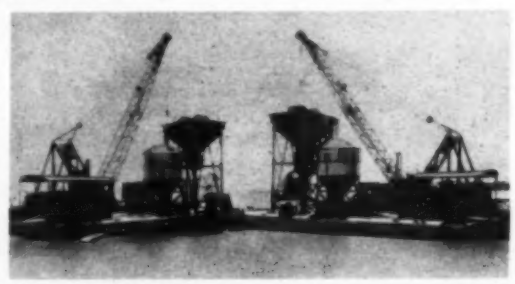
1. **Speed**—G-E motors, with their accurate control, contribute to high-speed operation.
2. **Reliability**—G-E quality assures continuous operation on day-and-night schedules under all types of working conditions.
3. **Availability**—General Electric's nationwide system of warehouses and large stocks of standard apparatus assure prompt delivery of electric equipment.

Get these profit-building features for your jobs by specifying G-E motors and control for your construction machinery. Investigate, also, General Electric's complete line of transformers, switchgear, cable, flood-lighting apparatus, and other equipment for construction jobs.

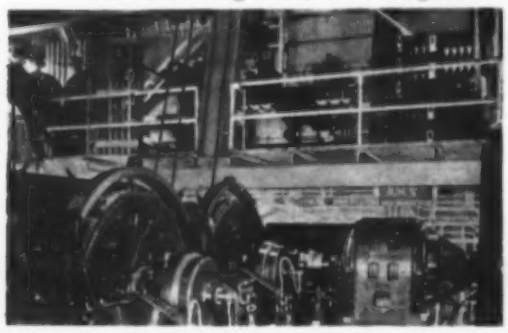
Our sales engineers will be glad to show you how G-E equipment can speed your work and save you money. Just call or write the G-E office nearest you. General Electric, Schenectady, N. Y.



HOISTS G-E 250-hp. motor geared to hoist drum used in construction of Water Tunnel No. 2 for New York City. Sixteen of these equipments removed approximately 2,400,000 yards of broken rock from the tunnel through shafts varying in depth from 480 feet to 780 feet. This and other G-E equipment on this job paid Patrick McGovern, Inc., the contractor, big dividends in time saved.

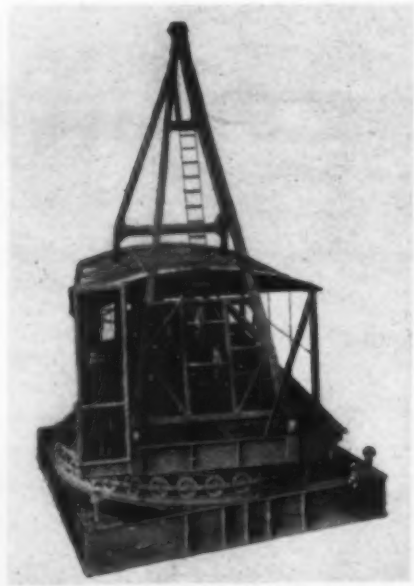


CRANES Two of four G-E equipped American Revolvers built by the American Hoist and Derrick Company for handling all cement and aggregates at Gen. Joe Wheeler Dam. Similar equipments are in use at the San Francisco-Oakland Bay Bridge and on other projects.



CABLEWAYS View of G-E motor and control equipment in head tower of Lidgerwood cableway at Norris Dam. G-E controls keep towers in line, and make possible swift, accurate operation.

Ballasting the track for head towers (in background) of cableways at Bonneville Dam. These cableways are completely G-E equipped, as are those at Norris Dam and Boulder Dam.



G-E equipped Clyde Wiley Whirley (with 95-foot boom removed) for concrete placing at Gen. Joe Wheeler Dam. Other Clyde Wiley Whirleys, equipped with G-E motors and control, will be used at Grand Coulee Dam and on other jobs.

G-E SERVICE

General Electric equipment (at New York City Water Tunnel No. 2) included 16 motors and control for hoists; 67 five-ton storage-battery locomotives; numerous motor-generator sets; and motors and control for air compressors, pumps, and blowers.

After this equipment had been in service 30 months, Mr. A. A. MacInnes, purchasing agent of Patrick McGovern, Inc., the contractor, wrote:

> "This equipment has encountered severe 24-hour service during the past two and one-half years. We wish to compliment you on the most satisfactory performance we have had from this equipment, as well as the splendid service rendered by your company in all matters pertaining to it."

020-163

GENERAL ELECTRIC

FASTER SCHEDULES AT LOWER COST

'INCOR' CUTS FORM EXPENSE $10,000 ON WORLD'S FINEST RACE TRACK

WHEN Suffolk Downs, "world's finest race track," East Boston, Mass., opened on July 10, 1935, records were shattered—not by horses, but by men.

Ten weeks before, the track site was a barren waste, a public dump. 3,500 men had labored since May 1 under the direction of A. G. Tomasello & Son, Boston, Mass., contractors. Completion on scheduled time was a personal triumph for Joseph A. Tomasello, president of the firm, Mark Linenthal, engineer, and those associated with them.

'Incor' Reduces Cost

The Aberthaw Company, general contractors for the grandstand, used 'Incor' 24-Hour Cement exclusively for all work above the foundations, in order to reduce the high cost of the required speed. Concrete work on the mezzanine floor and bleacher section of this grandstand, said to be the largest at any race track in the world, started May 24th, was completed June 21st; over 8,000 cu. yds. of concrete were placed.

Concrete was placed in 10 main sections. With ordinary cement, forms would have remained in place six days, requiring the purchase of lumber for forms for the entire job. *Using 'Incor' reduced the amount of lumber by 62½%, because it permitted stripping in two days, making possible prompt re-use of forms further along.*

Net Saving: $7,000

This meant a saving of $10,000 on form lumber and make-up, according to Aberthaw, due to the use of 'Incor'. The extra cost of 'Incor' was $3,000—so the net saving was $7,000.

Here's the essential point: Of course 'Incor' is a big time-saver; it solves many an emergency problem. But it goes much deeper than that—for 'Incor' saves money by canceling out the costly waste involved waiting for ordinary concrete to harden. This basic principle applies wherever concrete is used—it justifies the suggestion to figure 'Incor' against ordinary cement—and may the "best man" win!

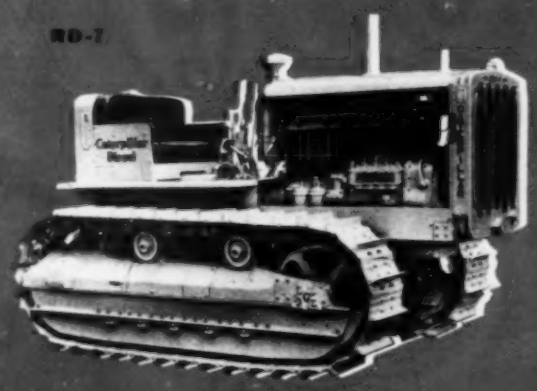
'Incor'* is made and sold by producers of Lone Star Cement, subsidiaries of International Cement Corporation, New York; also sold by other cement manufacturers. *Reg. U. S. Pat. Off.

'INCOR' 24-Hour Cement

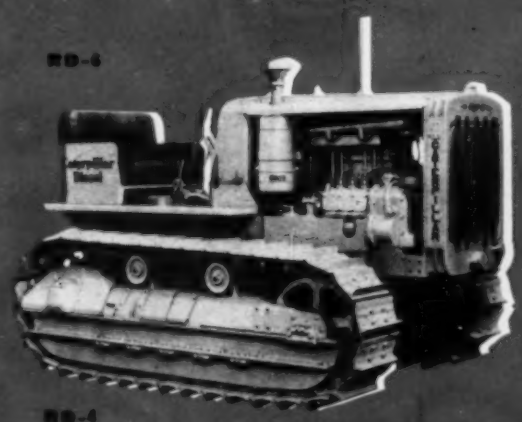
FIRST IN POWER PERFORMANCE SAVINGS

RD-8

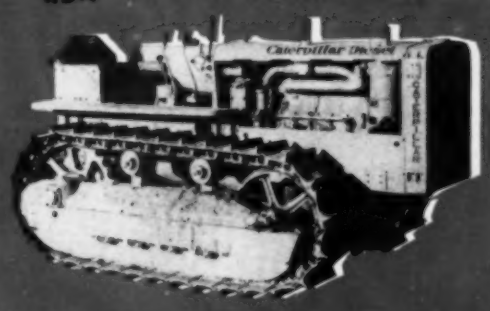
RD-7



RD-6



RD-4



Over 9000 "Caterpillar" Diesels are saving money for their users. . . . Now, new models offer more power, greater work-production, bigger savings than ever before. . . . New models, topped by the RD-8, biggest, most powerful tractor on the market today. . . . New models including a smaller size, RD-4 (deliveries begin in February, 1936) that extends "Caterpillar" Diesel advantages to new thousands of tractor users. . . . New prices, offering more usable horsepower per dollar of purchase price than ever before in tractor history. . . . Now is the time to replace your present obsolete power. . . . Let your "Caterpillar" dealer prove to you, by facts, figures, demonstration, that these new tractors are the biggest values in the power world today. . . . Get the SHOW-DOWN! Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR

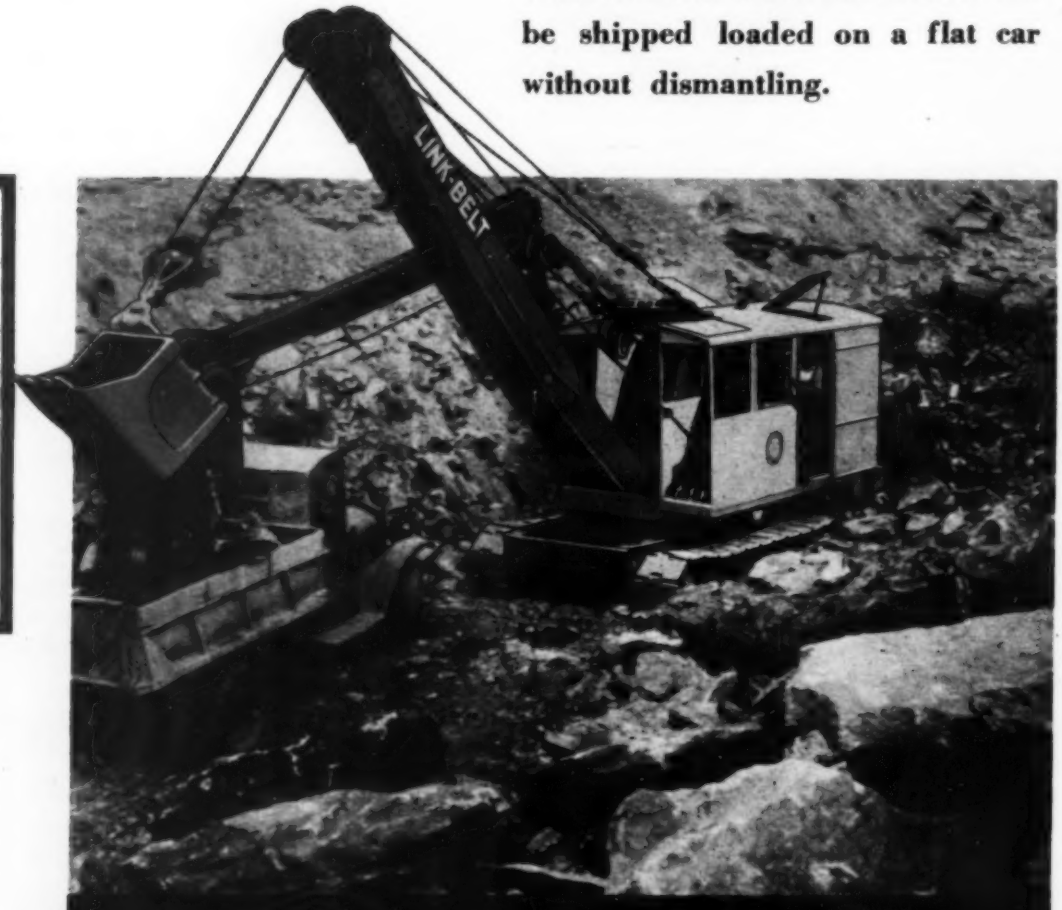
REG. U. S. PAT. OFF.

DIESEL

FEATURES?—SURE—LINK-BELT FEATURES THE WHOLE UNIT

"Special features" count for little unless the construction of *every* working part in the whole machine excels. For years the Link-Belt has worked with many of the world's most efficient contractors on their toughest jobs, proving over and over the vital necessity for machinery being built "good all the way through". Let one part weaken in its functioning and other parts are thrown out of adjustment—wear sets in—loss of service and money results. The whole Link-Belt unit—is built for stability, power and speed.

From ¾ to 3 yds. capacity, heavy-duty built. Gas engine, Diesel or electric motor drive. All models can be shipped loaded on a flat car without dismantling.



LINK-BELT

SHOVEL-CRANE-DRAGLINE

LINK-BELT COMPANY, 300 W. PERSHING ROAD, CHICAGO

5167-A

Offices and Distributors in All Principal Cities

LET THE GULF ENGINEER HELP YOU PROTECT COSTLY EQUIPMENT !

The dust, dirt and mud encountered in operations like the above, make proper attention to lubrication doubly important for trucks and excavators. Use of the right Gulflubricants, proper application and frequent renewals will help keep maintenance costs at a minimum for this type of equipment.

Heavy road equipment, like the machine at the left, is subjected to the hardest kind of gruelling service—and needs the protection of quality lubricants, properly applied. Gulf supplies the right oils and greases to protect and prolong the life of equipment like this.

From Maine to Texas . . . *Gulf Quality Lubricants and Engineering Service are Helping Contractors Speed their Jobs . . .*

CONTRACTORS who use heavy equipment, like that shown above, have a large investment to protect.

That is why careful attention to lubrication is so important. Use of the right Gulf lubricants, scientifically applied *at the proper intervals* is a real safety measure against excessive friction, wear and ultimate repair bills.

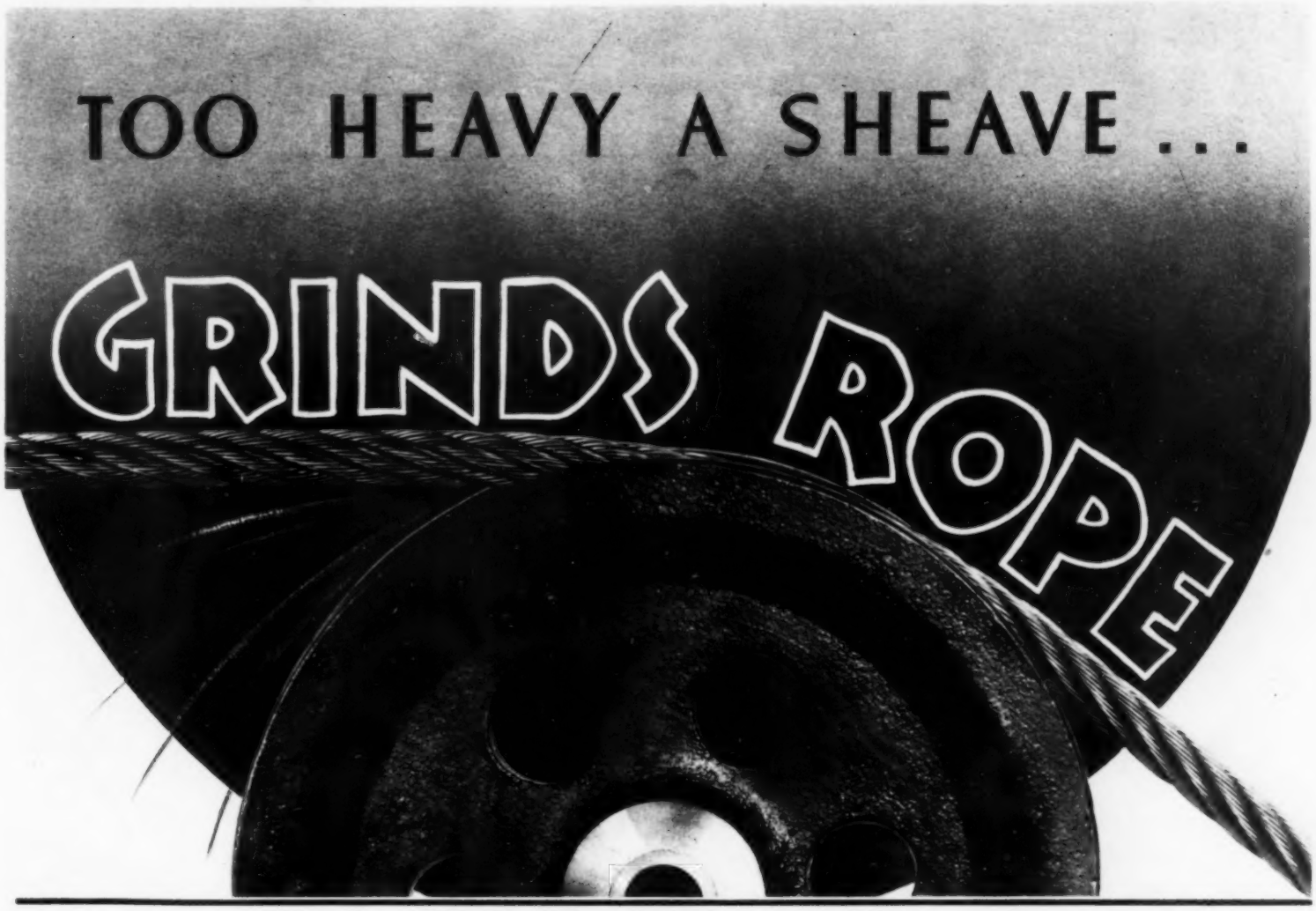
Let a Gulf engineer recommend the right lubricants—and their proper application—for your equipment. You will be pleased with the economies which accompany the use of Gulf products.

Enjoy Gulf's new radio program featuring Phil Baker in "The Great American Tourist" over CBS Sunday Evenings 7:30 E.S.T.

GULF INDUSTRIAL LUBRICATION

GULF REFINING COMPANY, Pittsburgh, Pa.

District Sales Offices: Boston · New York · Houston · Atlanta
New Orleans · Philadelphia · Pittsburgh · Louisville · Toledo



Know your Ropes

. . . This is a helpful hint, how to make wire rope last longer. Subsequent Wickwire Spencer advertisements in this publication will give other dollar-saving information. Tell us about your rope problem and we will give you the answer.

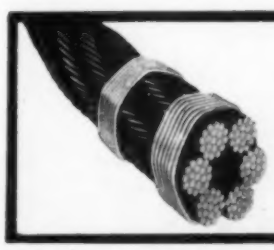
A heavy sheave starts too slowly and when running builds up an unnecessary amount of momentum. When light loads give inadequate traction, the sheave frequently slips with starting and stopping and acts as a grinding wheel on the outer strands of the rope. This naturally causes undue wear and wire breakage.

A correct balance between the applied rope load and the weight of the sheave may be obtained. We will gladly send you this valuable information. Our assistance in solving your problem will be helpful.

●

WICKWIRE SPENCER STEEL COMPANY, *General Offices:* 41 East 42nd Street, New York. *Sales Offices and Warehouses:* Worcester, New York, Chicago, Buffalo, San Francisco, Los Angeles; *Export Sales Dept.:* New York. WICKWIRE SPENCER SALES CORPORATION, New York, Chattanooga, Tulsa, Portland, Seattle.

WIRE ROPE
by Wickwire Spencer



BOTH . . . STANDARD LAY AND WISSCOLAY PREFORMED.

Wickwire Spencer manufactures all sizes and types of Wire Rope in standard lays and preformed. Wisscolay preformed wire rope will often solve a wire rope application difficulty. Ask our engineers where and when it shoula be used. Send for a free WIRE ROPE BOOK. It will prove of great value.

Let's Look at Cordeau - - for Giant Blasts, et cetera

What do we mean by "et cetera"? Anything from giant blasts to single shots, with well drill, wagon drill or jack-hammer holes; pocket, tunnel and broken loads; mud capping, demolition, ditching, and submarine . . .

Look at Cordeau-Bickford Detonating Fuse *for better blasting*. Maybe you can use it profitably.

1. ***More work from explosives*** because the line of Cordeau acts as a detonator for *each* cartridge in the hole. The detonating wave is carried by the Cordeau.
2. ***Less Hazard*** because Cordeau is an insensitive detonator—a lead tube filled with TNT. It must be detonated: ordinary shocks do not affect it.
3. ***Simplified Loading*** because no primers are needed in the loads.
4. ***Better Fragmentation*** because the Cordeau hook-up can be planned to fire each hole in rotation. *The time interval is infinitesimal*, yet it serves to *relieve burden*.
5. ***Equipment moved less often*** because drilling can be completed and all shots fired as a single blast—with Cordeau. When drills, pipe lines, compressors, scrapers, shovels and clearing gangs can be left in position until their work has been completed, we have a decided saving in time, labor and equipment.

Send for a copy of the Cordeau Book. There is no charge.

THE ENSIGN-BICKFORD COMPANY, *Simsbury, Conn.*

CORDEAU
DETONATING FUSE
BICKFORD

ALSO SAFETY FUSE *Since* 1836

THE ENSIGN-BICKFORD COMPANY

CB-49

INLAND Sheet Piling Used on WORLD'S LARGEST Cofferdam

Highest Ever Built

The west-side cofferdam at Grand Coulee, one of the three which will be needed in the construction of this great project. This cofferdam was completed in three months. It is almost one-half mile in length, 800 feet wide and 115 feet high. To attain this height, 35 and 40-foot piling was interlocked into a lower wall of 75 and 80-foot piling. Driving distance ranged from 40 to 70 feet to bed rock, requiring at times 400 blows per foot of penetration. The cofferdam will hold back the highest head of water of any structure ever built for a similar purpose. The project is being built by the Bureau of Reclamation of the U. S. Department of Interior. Contractors, Mason-Walsh-Atkinson-Kier Company.

APPROXIMATELY 19,000 tons, more sheet piling than has ever before been involved in a cofferdam for a construction project, is being used for the Grand Coulee Dam on the Columbia River. And, it is all Inland Steel Sheet Piling.

A New Section Shipped in a Week

The contract called for shipments to begin in 7 days, to be completed in 100 days. And also for long length material which would withstand very hard driving.

Despite the fact that the section specified, I-31-S, had not been previously rolled by Inland, the piling met every requirement to the perfect satisfaction of the contractors and the Government engineers.

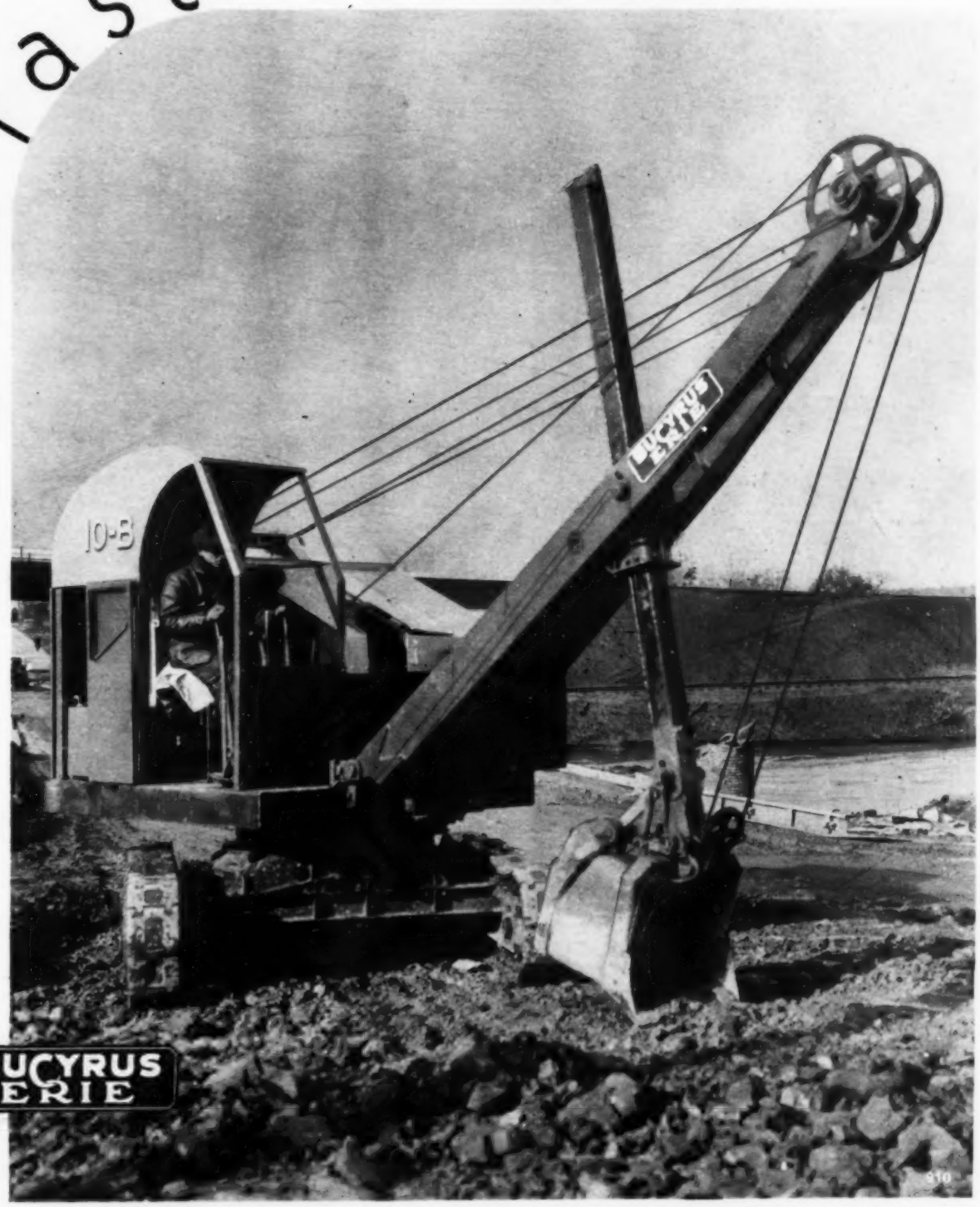
This splendid example of Inland Service and Inland quality surely warrants your use of Inland material on your next Sheet Piling project. INLAND STEEL COMPANY, 38 South Dearborn Street, Chicago, Illinois.

INLAND STEEL

Sheets Strip Tin Plate Plates Structurals Piling Rails Track Accessories Bars Rivets Billets

5 CYCLES a minute in most digging is nothing unusual for the 10-B. So sure and easy to handle are the controls that the operator can maintain top speed hour after hour. This full-revolving ⅜-yard machine travels up to 4¼ miles per hour, hustles up grades even steeper than 30%, and "turns on a dime" at full speed. A light, pneumatic-tired trailer is available. The 10-B is outstanding in modern high-speed performance; put it on your jobs today.

fast



BUCYRUS-ERIE

EXCAVATING, DRILLING, AND MATERIAL-HANDLING EQUIPMENT...SOUTH MILWAUKEE, WISCONSIN

KOEHRING

THE KOEHRING CHAIN CROWD

— is a single continuous chain traveling *inside* of the high strength welded boom. The boom can be quickly and easily raised or lowered without manual adjustments or affecting the crowding effort. The chain tension is automatically maintained regardless of boom movement.

KOEHRING HEAVY DUTY

KOEHRING COMPANY

Pavers · Mixers · Shovels · Cranes · Draglines · Dumptors · Mud-Jacks

3026 WEST CONCORDIA AVENUE, MILWAUKEE, WISCONSIN

ON DIRT-MOVING JOBS IT PAYS TO HURRY WITH HUGS

● Through axle-deep mud and muck a fleet of 9 Model 87Q Hug Roadbuilders is moving dirt in record time, and at the lowest possible cost, for Wm. Lathers, Jr., on a dirt-moving project at LaCrosse, Wis. The "87Q," with its powerful Buda truck engine, 12-speed forward, 3-speed reverse transmission goes right on through where other units bog down . . . And the overgear drive provides extra speed for the return trip empty.

On this job, as on others, Hug Roadbuilders have proved their leadership — and proved it by direct performance and cost comparison. Hug Roadbuilders are designed and built especially for the job on which they are to be used. Consequently they can haul bigger loads — haul them faster — and still be hauling them profitably, years after ill-adapted lightweight equipment has outlived its relatively short span of usefulness.

Hug Roadbuilders are designed and built for those unusual conditions where the going is tougher than expected. Into every Hug is built that extra stamina, extra power, extra speed — all with an amazing ease of handling due to the equalized load distribution, short turning radius and the famous Hug Front Axle Rocker Action.

Your Hug dealer can show you how to eliminate troublesome, costly delays with Hug Roadbuilders. See him at once or write us for full information.

THE HUG COMPANY
540 CYPRESS STREET, HIGHLAND, ILL.

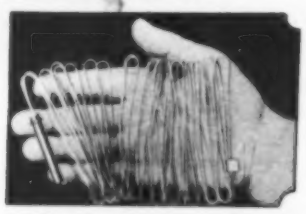
● *Four of a fleet of nine Model 87Q Hug Roadbuilders, with six-yard dirt bodies, delivered to Wm. Lathers, Jr., of Madison, Wisconsin.*

BUILT TO MEET A CONDITION

(*Left*) Cross section showing accordion fold wires around detonator. (*Below*) Photograph showing how wires give end protection to detonator.

Count the Wires!

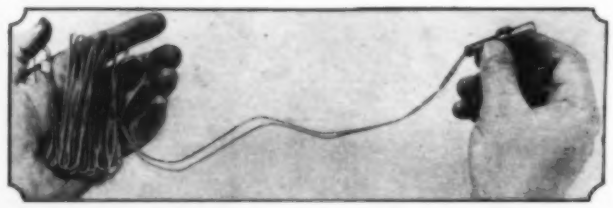
In a 6-Foot Wire Atlas Accordion Fold Electric Blasting Cap There Are 48 Strands of Wire Protecting the Detonator



Handy to carry. Easy to open. Wires folded accordion-wise, and supported by the tube, enclose and cushion the detonator. When tube is removed wires extend naturally into position.

The compactness of the genuine Atlas Accordion Fold package permits the entire surrounding of the sensitive detonator with a *maximum number* of wires. Ends as well as sides are cushioned against external shock. The full length tube holds the assembly snugly in place, providing the blaster with "a unique package of safety and convenience."

No wonder the use of Atlas Accordion Fold Electric Blasting Caps has become standard practice! No wonder this Atlas "First" has taken the foremost position in the field. Note the features of safety. Note the features of convenience. Profit by both—in your blasting operations.



ATLAS POWDER COMPANY, WILMINGTON, DEL.

Cable Address—Atpowco

Everything for Blasting

OFFICES

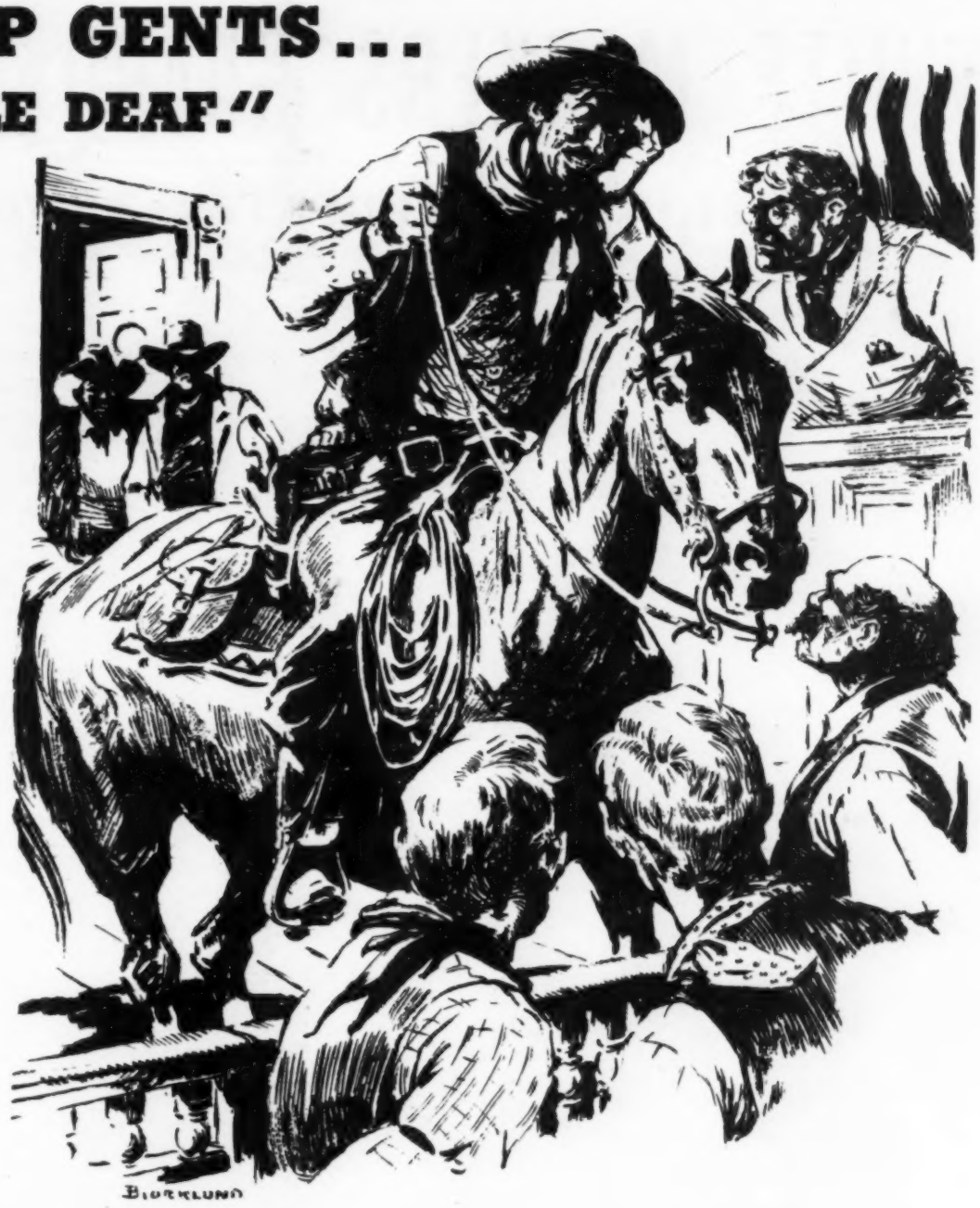
Allentown, Pa.	Joplin, Mo.	New Orleans, La.	Pittsburgh, Pa.	Spokane, Wash.
Boston, Mass.	Kansas City, Mo.	New York, N. Y.	Portland, Oregon	St. Louis, Mo.
Butte, Mont.	Knoxville, Tenn.	Philadelphia, Pa.	Salt Lake City, Utah	Tamaqua, Pa.
Denver, Colo.	Los Angeles, Calif.	Picher, Okla.	San Francisco, Calif.	Wilkes-Barre, Pa.
Houghton, Mich.	Memphis, Tenn.	Pittsburg, Kansas	Seattle, Wash.	

ATLAS

EXPLOSIVES

CHEMICALS ATLAS EXPLOSIVES

"SPEAK UP GENTS... I'M A LITTLE DEAF."



Of all the bad men and desperadoes produced by Texas, not one of them, not even John Wesley Hardin himself, was more feared than Ben Thompson. Sheriffs avoided serving warrants of arrest on him. It is recorded that once, when the county court was in session with a charge on the docket against him, Thompson rode into the room on a mustang. He bowed pleasantly to the judge and court officials—

> "Here I am, gents, and I'll lay all I'm worth that there's no charge against me. Am I right? *Speak up, gents. I'm a little deaf.*"

There was a dead silence until at last the clerk of the court murmured, "No charge".

RED HANSON
the man who job tests American Shovels before they are shipped

SAYS RED—"It was back in those roarin' days of the old west that American Contractors and Industrial Equipment was building the empire of yesterday, just like American Shovels are doin' the diggin' for the empire of tomorrow."

FREE enlargement of the above Western picture suitable for framing, together with the complete story.

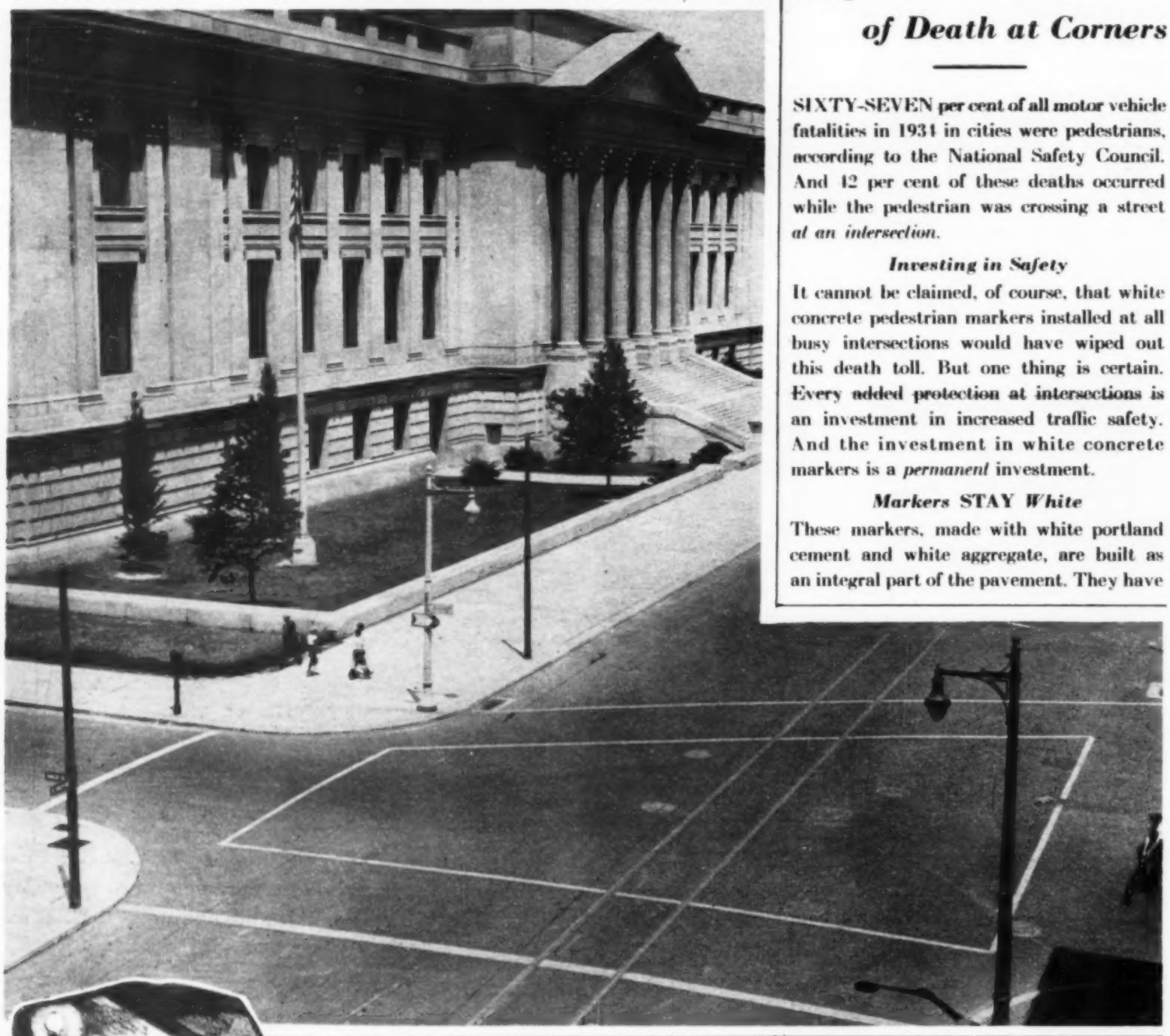
Ask for the Free new three-color American Shovel-Crane-Dragline circular in convenient letter file form with complete table, data and information on special features.

AMERICAN HOIST & DERRICK COMPANY
SAINT PAUL, MINNESOTA

AMERICAN Gopher SHOVELS
CRANES · DRAGLINES

WHITE MARKERS GUARD CROSSINGS

PROTECTION FOR PEDESTRIANS



Atlas White concrete pedestrian lane markers guard this intersection on 20th Street in Philadelphia by the Benjamin Franklin Memorial. Installation by Eastern Asphalt Co., Philadelphia, under the direction of Dudley T. Cornung, Chief Engineer, Philadelphia.

★ ★ ★

White concrete pedestrian markers can help to cut down intersection fatalities—they are a permanent investment in traffic safety.

190

Help Cut Down Toll of Death at Corners

SIXTY-SEVEN per cent of all motor vehicle fatalities in 1934 in cities were pedestrians, according to the National Safety Council. And 42 per cent of these deaths occurred while the pedestrian was crossing a street *at an intersection.*

Investing in Safety

It cannot be claimed, of course, that white concrete pedestrian markers installed at all busy intersections would have wiped out this death toll. But one thing is certain. Every added protection at intersections is an investment in increased traffic safety. And the investment in white concrete markers is a *permanent* investment.

Markers* STAY *White

These markers, made with white portland cement and white aggregate, are built as an integral part of the pavement. They have a dense, hard, white surface that traffic stains and weather cannot blot out or wear away. They *stay* white. Once installed, they last as long as the pavement lasts—always on the job, always easy to see.

Valuable Information

For complete information on these indelible white traffic markers that never need replacement, write to Universal Atlas Cement Co. (United States Steel Corporation Subsidiary), 208 South LaSalle Street, Chicago.

Build Safety into Streets and Highways with

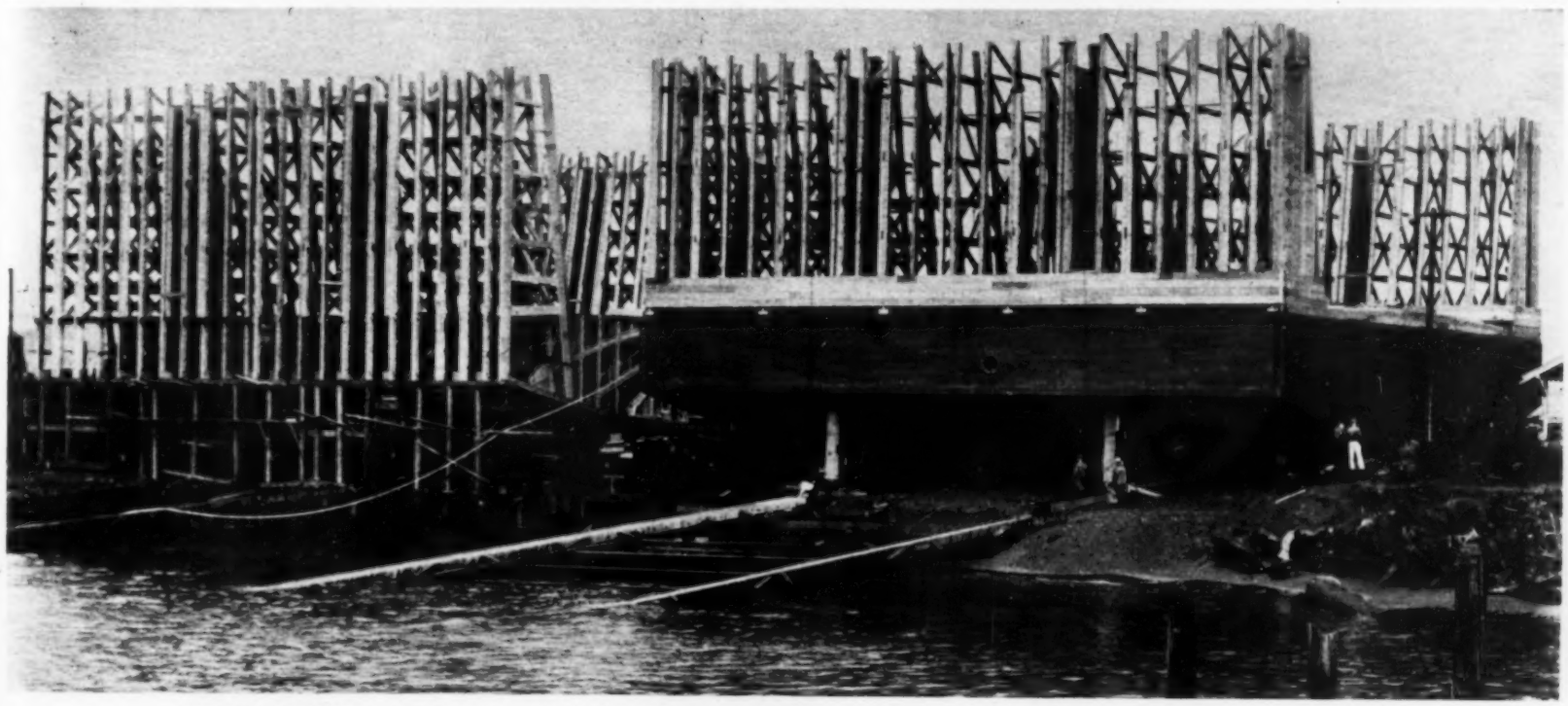
ATLAS WHITE TRAFFIC MARKERS

Made with Atlas White Portland Cement—Plain and Waterproofed

Construction Methods

ROBERT K. TOMLIN, Editor

Established 1919—McGraw-Hill Publishing Company, Inc. Volume 17—Number 12—New York, December, 1935

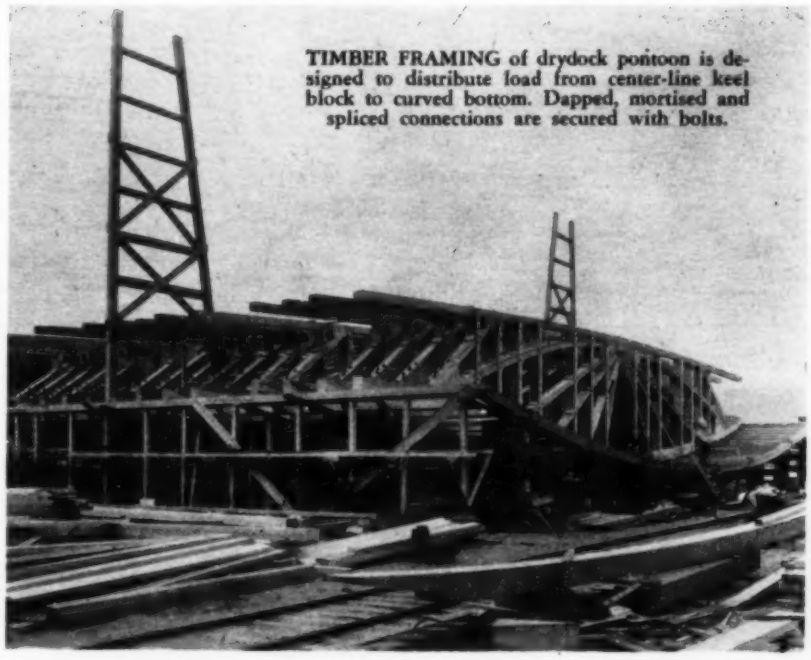


TWO PONTOONS of sectional timber drydock at different stages of construction. Section at right is ready to be launched. Curved bottom is designed to give greater strength and stability than conventional flat bottom.

Big Timber Floating Drydock Has SEMICIRCULAR BOTTOM

A FLOATING timber drydock of sectional construction now being built by Todd Seattle Dry Docks Inc., at Seattle, Wash., has a curved bottom instead of the ordinary flat type. This feature is expected to provide greater stability and strength. The drydock will have an overall length of 531 ft., including aprons, and a capacity of 16,000 tons, sufficient to lift any vessel now operating out of Seattle.

Five timber sections are involved in the construction of the drydock. Individual sections are 90 ft. long by 126 ft. 8 in. wide, with a molded depth of 18 ft. 4 in. Each section is divided into six watertight compartments and, in addition, has four swash bulkheads parallel to the center line of the dock. For purposes of unwatering, each section will have two 18-in. vertical centrifugal pumps driven by individual electric motors mounted on the towers of the dock. To flood a section, each watertight compartment is provided with an 18-in. flood valve.



TIMBER FRAMING of drydock pontoon is designed to distribute load from center-line keel block to curved bottom. Dapped, mortised and spliced connections are secured with bolts.

In addition to the drydock, the Seattle firm is building a new pier 575 ft. in length, equipped with crane facilities, to serve as a mooring for the new dock as well as furnish additional berthing space. In all, the improvements represent an expenditure of more than $500,000. The new drydock alone requires about 5,000,000 b.ft. of lumber.

It is expected that four pontoons of the new drydock will be in operation by the end of the year and that the dock will be completed early in 1936. The plant then will possess one 16,000-ton, one 15,000-ton and one 3,000-ton drydock.

C. W. Wiley is president of Todd Seattle Dry Docks Inc., and R. J. Lamont is vice-president and general manager. Plans and specifications for the new drydock were drawn by Admiral Frederic R. Harris, of New York.

This "NEWS

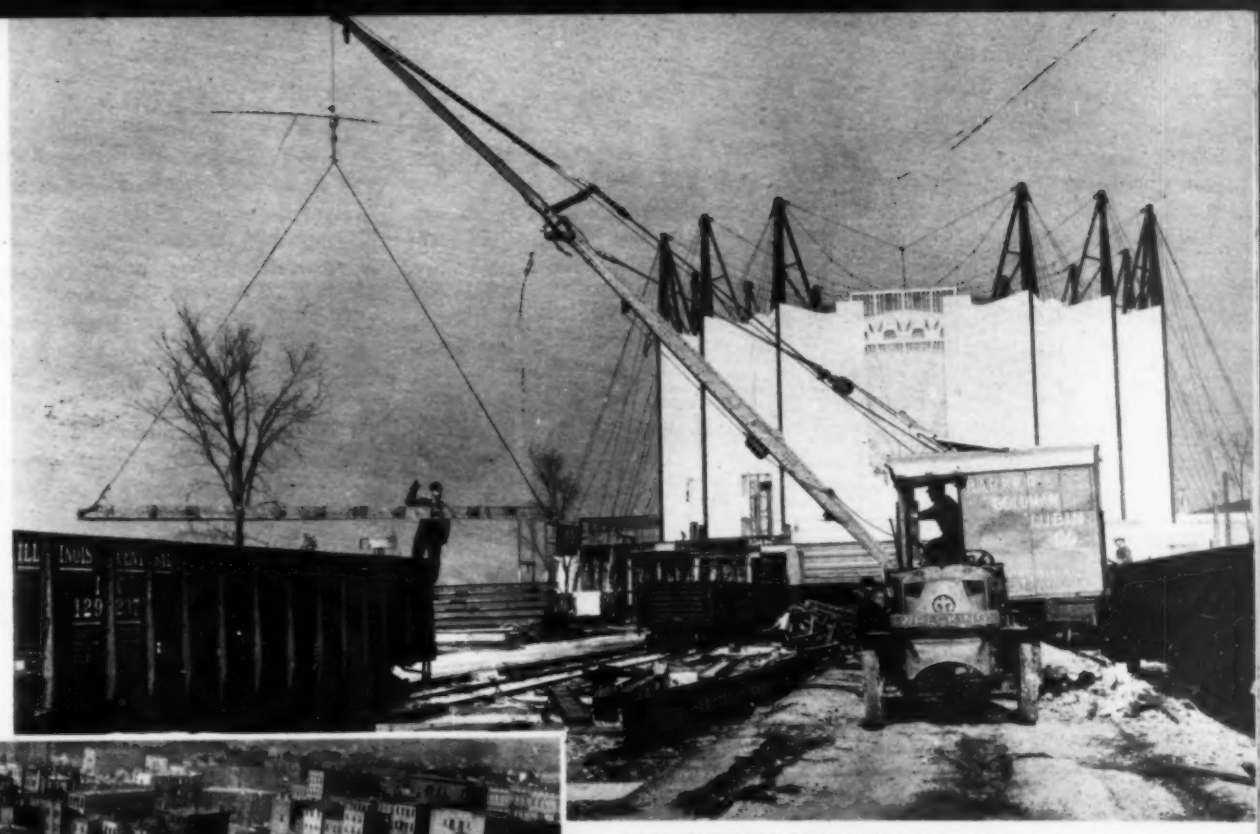
NEARLY READY FOR TRAFFIC. Main steel superstructure of Mississippi River bridge at New Orleans, La., involving 790-ft. central cantilever span, erected with guy derricks, and total length of 23,000 ft., including viaduct approaches, is practically finished. Structure costing $13,000,000, financed by RFC loan, was designed by Modjeski, Masters & Case, consulting engineers, of New York. River crossing was erected by American Bridge Co. on tall piers built under difficulties by artificial "sand island" caisson method by Siems-Helmers, Inc., of St. Paul, Minn.

BUILT IN RECORD TIME. *(Below)* Concrete and steel grandstand to seat 11,000 spectators at new Suffolk Downs racetrack, East Boston, Mass., was finished by Aberthaw Co., Boston contractor, with maximum force of 600 men, in only 46 working days, as described elsewhere in this issue. Use of high-early-strength concrete speeded stripping and re-use of forms on 185x600-ft. structure built on 1,408 composite piles 70 ft. in average length.

MARYLAND'S LONGEST BRIDGE *(below)*, located at Cambridge and extending 8,700 ft. across Choptank River, was officially opened Oct. 27 when President Roosevelt, aboard yacht "Sequoia," was first to pass through draw. Trestle structure has main river span of four 260-ft. steel through-trusses, one of which is swing span affording 100-ft. clear channel openings. Contractor, Frederick Snare Corp., New York.

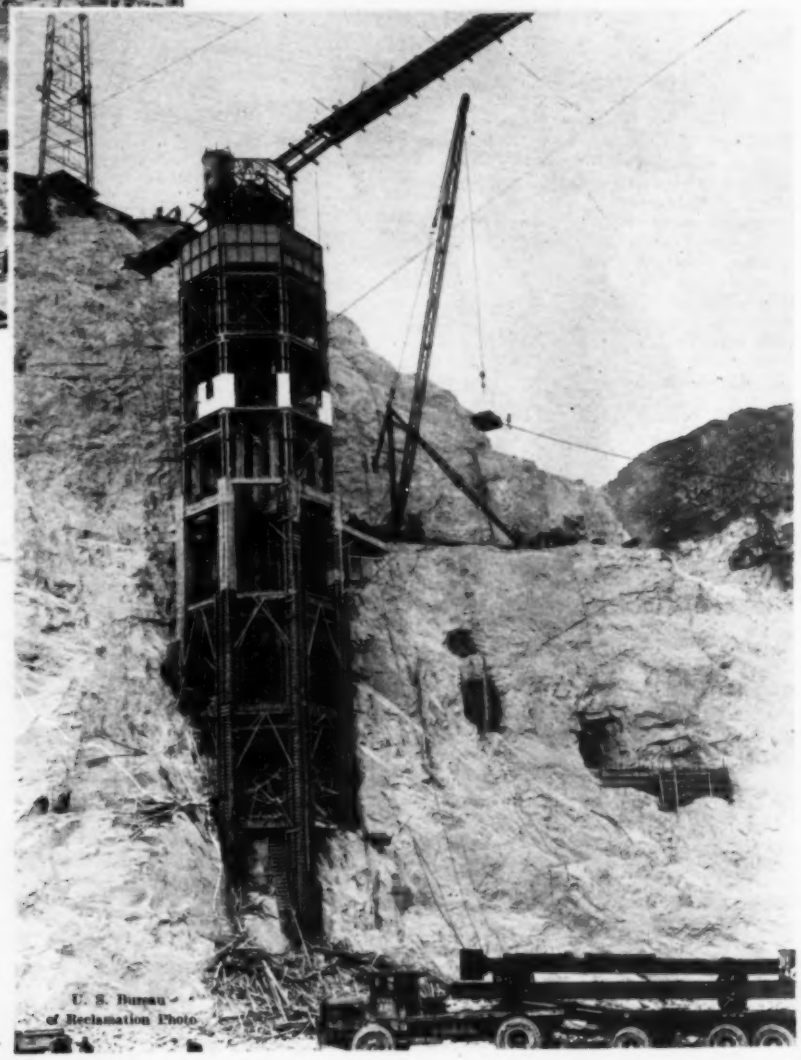
HOLING THROUGH *(right)* of Seven Palms tunnel on Colorado River aqueduct is accomplished Oct. 17 by forces of Metropolitan Water District of Southern California working from west portal on bore 11,900 ft. long joining 4,810-ft. section previously driven from East Portal. *(Left to right)* Superintendent Tim Sides, Inspector Bill Saunders and Walker "Red" Ferry.

Month's *REEL"*



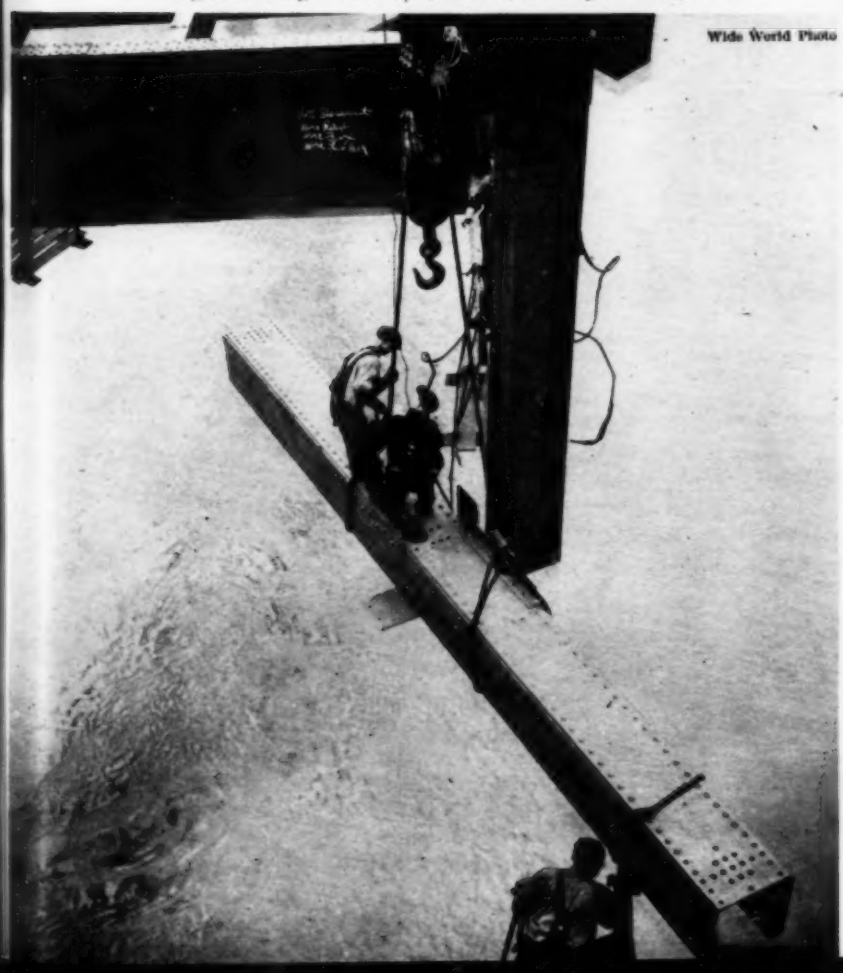
DEMOLITION OPERATIONS are in progress at Chicago's Century of Progress Exposition grounds along Lake Michigan. Universal truck-crane with 44-ft. boom is loading material into cars near Transportation Building, structure with unique type of cable-suspended roof.

SLUM CLEARANCE is begun as preliminary to PWA's $12,783,000 low-cost housing project in Williamsburg district of Brooklyn, N. Y., largest single undertaking of its kind in federal Housing Division's program. Project covering 24-acre site within 12 square blocks will provide living quarters for 1,625 families in 20 new apartment buildings, according to A. R. Clas, director, Housing Division, PWA.



U. S. Bureau of Reclamation Photo

MIXING PLANT ON STILTS. Unusual structure is erected on west bank of Columbia River by Mason-Walsh-Atkinson-Kier Co., to supply concrete for U. S. Bureau of Reclamation's Grand Coulee dam in Washington. At top of plant carried by tall steel and concrete columns is floor of cable suspension bridge supporting belt conveyor for delivery of sand and gravel across river.



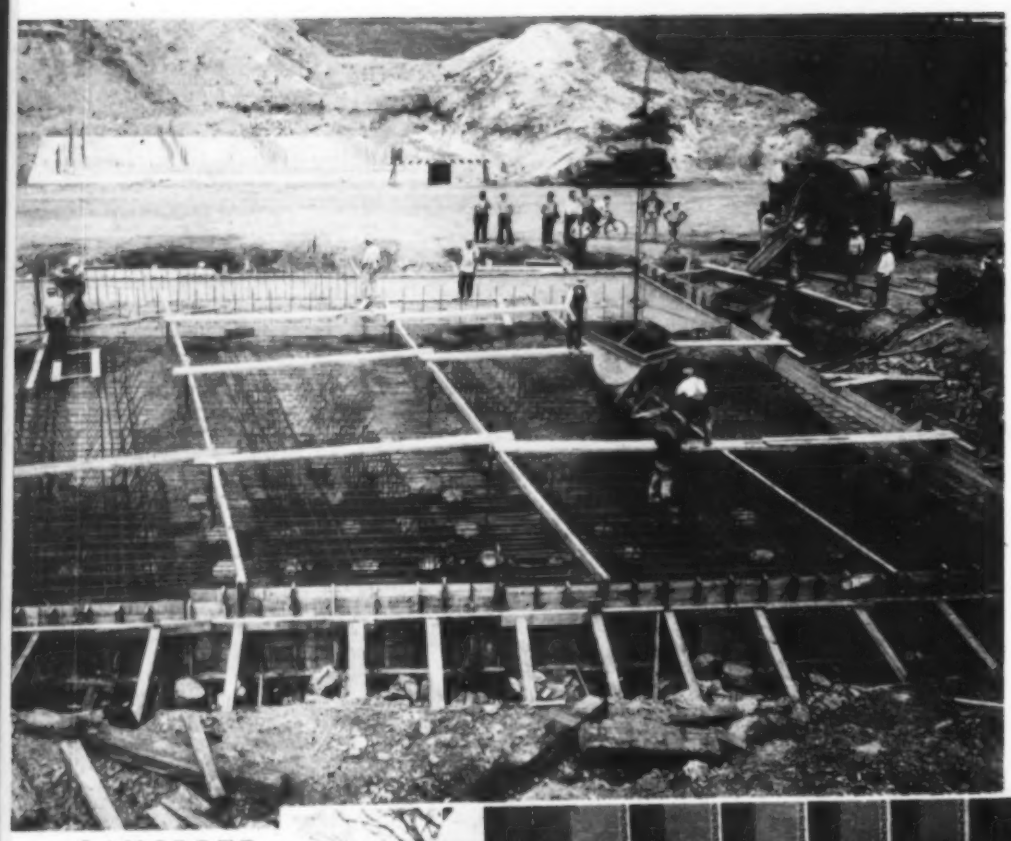
Wide World Photo

LAST STEEL MEMBER *(left)* is placed in 1,380-ft. main suspension span of Triborough bridge, across East River, New York City. Structure connecting boroughs of Queens, Manhattan and The Bronx is being built with PWA loan and grant of $44,200,000.

Truck Mixers Deliver Concrete to

26 Bridges

in Syracuse Grade Separation Project



CONCRETE *(above)* is delivered by truck mixer from central batching plant is placed by crane and bucket in reinforced-concrete mat supported by cast-in-place piles for foundation of cellular-type abutment. Completed footing can be seen on other side of roadway.

FLEXIBILITY in distribution was the essential requirement of the concrete plant which the Walsh Construction Co., of Davenport, Iowa, and Syracuse, N. Y., contractor, designed to build 26 bridges and intermediate retaining walls for the track-raising and relocation work of the New York Central and West Shore Railroads in Syracuse, N. Y. Concrete for the foundations and superstructures of bridge abutments and retaining walls, scattered at various locations along 5 mi. of line, amounted to almost 130,000 cu.yd. A central batching plant, set up near the center of the mass of concrete, and a fleet of five 4-yd. truck mixers were selected by the contractor as the most flexible and economical equipment to distribute concrete to the numerous locations. This plant frequently exceeded an output of 1,000 cu.yd. in a day of two 8-hr. shifts.

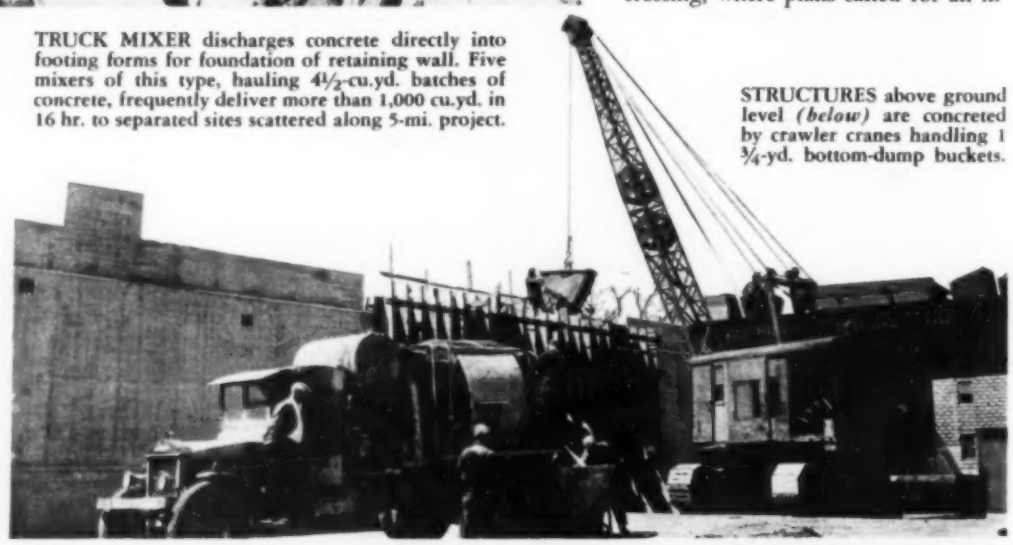
In addition to the large volume of concrete, the contract calls for 1,770,000 cu.yd. of sand and gravel fill to be placed in an embankment 5 mi. long. In loading and hauling this fill material and in raising the track level on the embankment, the contractor is employing methods which promote economical and effective handling of the work. By these means, a 170-ton locomotive is kept constantly busy moving loaded and empty trains between the gravel pit and the fill, about 9½ mi. apart, measured from the loading point to the center mass of the embankment.

Purpose of Project—As indicated by the accompanying map of the project, the present New York Central tracks in Syracuse are located in the middle of Washington St. All trains entering the Syracuse Station use these tracks. The present track-raising program utilizes the right-of-way of the West Shore Railroad. For about 2 years, traffic on the West Shore in the Syracuse area has been diverted to the New York Central tracks. The West Shore tracks crossed intersecting streets at grade except in the western part of the city, where the tracks were carried on embankment. Several streets in this area were bridged with steel girders on masonry abutments.

Under the present program an embankment averaging 20 to 25 ft. high through the heart of the city and ranging up to 40 ft. high at the west end is being built to carry three through tracks, one belonging to the West Shore and two to the New York Central. In the central part of the project, plans provide for a new passenger station, the platforms and canopies for which are included in the Walsh contract. Twenty-six steel-girder bridges involved in the improvement are located at 24 street crossings and at one stream crossing, where plans called for an in-

TRUCK MIXER discharges concrete directly into footing forms for foundation of retaining wall. Five mixers of this type, hauling 4½-cu.yd. batches of concrete, frequently deliver more than 1,000 cu.yd. in 16 hr. to separated sites scattered along 5-mi. project.

STRUCTURES above ground level *(below)* are concreted by crawler cranes handling 1 ¾-yd. bottom-dump buckets.



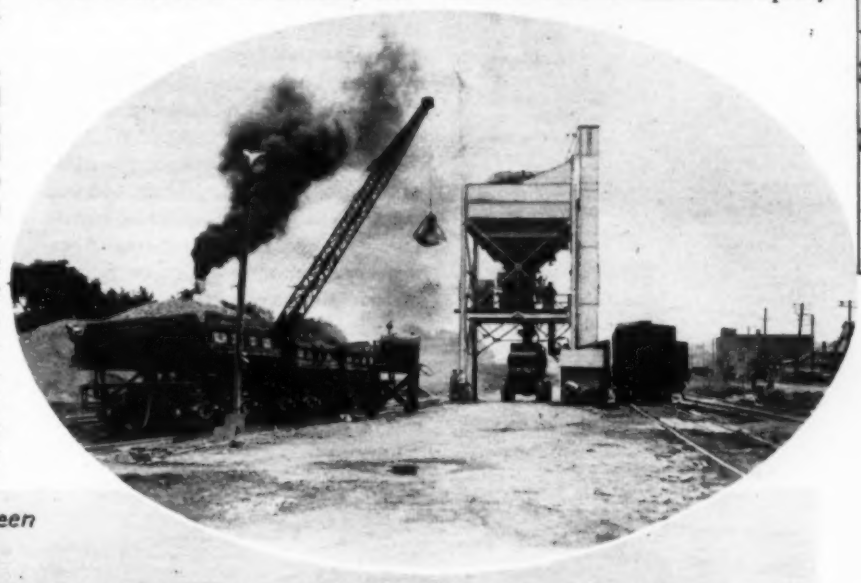
dustrial single-track bridge in addition to a three-track main-line bridge. A large volume of concrete was required for gravity retaining walls. Precast concrete crib walls ranging up to 23 ft. high were substituted for the gravity type at eight locations.

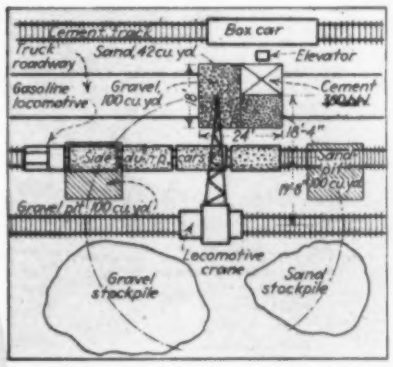
Foundations—A great variation in foundation conditions was revealed by preliminary borings and tests within the limits of the project. Foundation strata ranged from hardpan to soft material of apparently unlimited depth. The engineers designed spread footings for the hardpan and placed all other foundations on concrete or creosoted-timber piles. These foundations required the driving of about 205,000 lin. ft. of cast-in-place concrete piles and about 80,000 lin. ft. of creosoted timber piling.

Structural Design—Special requirements in two types of structures caused the engineers to create designs which are somewhat unusual. At the west end of the project, four bridges ranging up to 40 ft. high above street level had to be supported on concrete pile foundations in soft soil. To keep down the cost of the abutments and eliminate the thrust from the 40-ft. fill, which would endanger light abutments of ordinary type, the railroad bridge engineers designed a cellular abutment (illustrated by a photograph) in which the fill may take its natural slope under the deck slab without putting any load on the face wall.

Narrow right-of-way in the heart of the city made it necessary in the interests of economy to carry the three tracks of the railroad across some 110-ft. street spans on two outside girders, eliminating girders between the tracks and holding the track spacing to 13 ft., c. to c., instead of the 18 ft. otherwise required. In these structures, the girders were made of nickel steel because use of either ordinary structural steel or even silicon steel would have required prohibitive sections. The floor beams are 36-in., 300-lb. members, the heaviest rolled sections available.

Concrete Plant—In designing a plant which would have the necessary flexibility to deliver concrete at from one to six scattered locations in a single day, the contractor gave consideration to mixing plants mounted on flat cars and to concrete pumps, as well as to the central-batching and truck-mixing set-up finally selected as best adapted to local conditions on this project. Paved streets were available along both sides of the right-of-way to facilitate haulage from a central batching plant. With a fleet of truck mixers at his disposal, the superintendent had a practically unlimited range of points to which delivery could be made. By keeping a reasonable balance in the lengths of haul to various structures selected for concreting in one day, the contractor obtained close to maximum capacity from the truck-mixer fleet and from the batching plant.





CENTRAL BATCHING PLANT *(above and at left)* for truck mixers is arranged to permit handling of sand and gravel from track pits to overhead bins by locomotive crane operating on far side of aggregate-delivery track. Cement is received in bulk and is raised to overhead storage compartment by bucket elevator. Truck mixers drive through plant.

SAND AND GRAVEL PLANT is set up at natural deposit 9 mi. from batching plant on existing railway line connecting two sites. Raw gravel, excavated by 2-yd. dragline, is delivered to track pit in 40-cu.yd. hopper-bottom cars. Belt conveyors carry raw material to primary screening and crushing station and thence to final cleaning and washing equipment above sand and gravel bins. Trains of 12-yd. side-dump cars are loaded with aggregates under these bins for transportation to batching plant.

AT SECOND LOCATION OF BATCHING PLANT, laid out to provide adequate supply of concrete for reduced requirements of 1935 construction season, locomotive crane on elevated track handles sand and gravel directly out of gondola cars into overhead bins. Bulk cement is handled as before out of box car into boot of elevator.

Sand and gravel for the batching plant were brought to it over the West Shore tracks from the pit opened by the contractor east of the city. To assist in locating the batching plant, as well as in planning other parts of the work, the contractor's engineer provided a mass diagram to scale showing the volumes and positions of concrete structures. This diagram showed the center of mass of the concrete work to be in the station area in the vicinity of Almond St.

In selecting the truck-mixer fleet, the contractor made an intensive study of the relative merits of 2-yd., 3-yd. and 4-yd. units. At the beginning of the investigation, a larger number of small units was favored, but a careful analysis revealed the economy and advantages of a smaller number of 4-yd. mixers. Experience on the job has substantiated the conclusions reached by the preliminary study and has demonstrated the superior advantages of a small fleet of large truck mixers for a contract of this character. The contractor started truck mixing operations June 1, 1934, with a fleet of four 4-yd. units. A fifth 4-yd. mixer was added to the fleet on Aug. 28. Thus, during half of the six-month truck-mixing period in 1934, the fleet consisted of only four units, which delivered as much as 1,048 cu.yd. in one day of two 8-hr. shifts.

Batching Plant—Lack of space prevented location of the batching plant at the actual center of gravity of the concrete work. Just two blocks to the east the contractor found an ideal site in a West Shore freight yard, where sufficient space and tracks for material delivery were available. From this site the contractor sent out 93,000 cu.yd. of a total of 103,000 cu.yd. placed on the project between May and November, 1934.

A Butler plant with a through truck driveway for batching bulk cement and aggregates was erected on steel columns between tracks, as indicated by accompanying photographs and drawings. Sand and gravel were delivered in 12-yd. side-dump cars from the contractor's screening and washing plant. These cars dumped the aggregates into two pits of about 100-cu.yd. capacity each from which a locomotive crane with a 60-ft. boom picked up the sand and gravel in a 1⅜-yd. clamshell bucket and either placed them directly in the steel bins, rising 39 ft. above the ground, or stockpiled them for later use.

Bulk cement was delivered in box cars, from which men scooped it into the receiving hopper of a screw conveyor feeding a bucket elevator. The cement bin of the plant held 360 bbl. of material, and the sand and gravel bins had capacities of 42 and 100 cu.yd.,

respectively. One 8-ton Plymouth gasoline locomotive spotted material cars at the batching plant. A 2-yd. weighing batcher measured cement and aggregates for the concrete mixture, weighing out two batches for each charge of a mixer drum.

Concrete Production — Quantities of concrete placed in one 16-hr. day ranged up to 1,140 cu.yd. The five trucks worked a total of 80 hr. on this day and other typical days, when they placed 778.5, 1,014, and 1,080 cu.yd. On another day in which the total truck time was 72 hr., the fleet delivered 1,080 cu.yd. Round-trip hauls on these days ranged from ½ to 2 mi., except on the day of lowest yardage, when all five trucks hauled to one large abutment at the west end of the project over a round-trip distance of 4 mi. On the other days they delivered concrete to from two to six locations.

DIGGING TO 25 FT. BELOW GROUNDWATER LEVEL, three draglines at natural gravel deposit place heaped loads of 18 to 20 cu. yd. in side-dump cars of fifty-car trains. Three of these trains are kept in constant operation, shuttling back and forth between borrow pit and railroad embankment, average distance of 9 mi. apart.

TEMPORARY TRESTLES carry dump track across streets in western part of city, where existing railroad embankment is being raised to greater height, as indicated by deck elevation of new bridge.

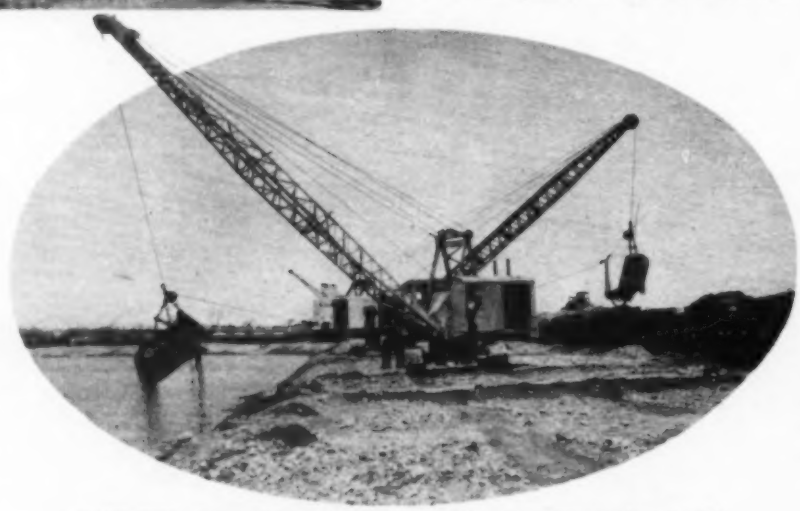
October, 1934, was the best month for concrete production. In this month, the five trucks placed 18,673 cu.yd. in 24 concreting days of 16 hr. each for an average of 778 cu.yd. per day. In view of the kind of structures in which the concrete had to be placed, the contractor and engineers considered this progress highly satisfactory. At the conclusion of 1934 concreting operations, the work was several weeks ahead of schedule.

Batching Plant Moved — To make way for the completion of a retaining wall at its former site (preparatory to placing 286,000 cu.yd. of fill in the station area) the batching plant was moved in the spring of the present year to a point two blocks east. Two 30-ton locomotive cranes picked up the plant intact, weighing 33 tons, and carried it to the new site. At the new location, bulk cement is delivered as before by box cars on a track laid on the same level with the truck roadway. Aggregates, however, are shipped from the screening plant in flat-bottom gondola cars which are unloaded by a locomotive crane on top of the embankment as indicated by one of the photographs. This method of handling aggregates is adequate for present requirements, which do not exceed 300 cu.yd. per day.

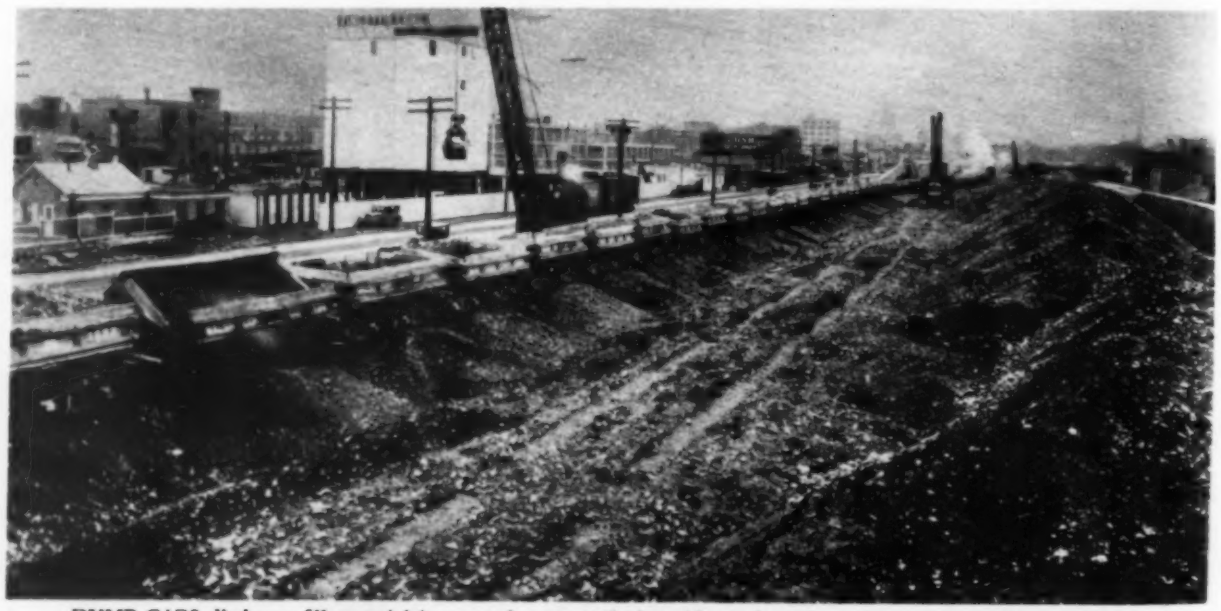
Formwork — For the placement of 103,000 cu.yd. of concrete in the six-month concreting period in 1934, the contractor built about 1,300,000 sq.ft. of forms. All exposed concrete surfaces were cast against forms lined with ¼-in. Masonite Presdwood. In the 1934 construction, the contractor used 85,000 sq.ft. of this lining material, which served for a number of re-uses. Abutments and retaining walls were built in one monolithic pour from the footing to the bridge seat or coping. The height of these monolithic lifts of concrete ranged up to about 35 ft.

For the large wall blocks the contractor constructed sectional wooden panel forms averaging about 450 sq.ft. in area. The panels consisted of 2-in. tongue-and-groove sheathing attached to 3x12-in. studs reinforced by double 4-in. steel channel wales fastened to the studs with lag screws and bolts. Form ties, designed with especially long detachable threaded shanks to allow for the 18-in. thickness of sheathing plus studs plus wales, were used to tie the form panels in abutments and retaining walls.

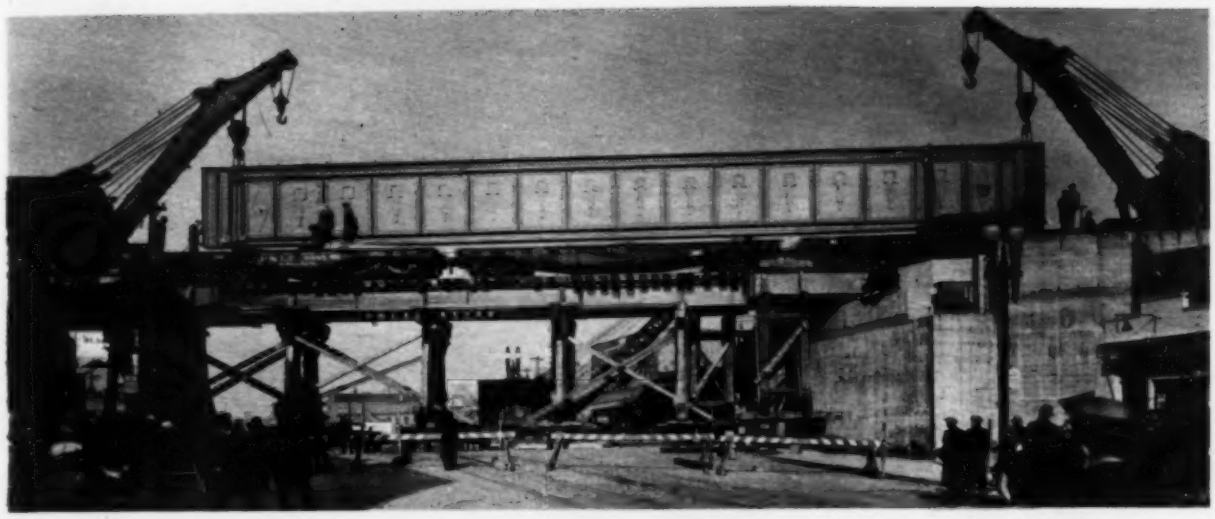
Gravel Plant—A level plot yielding sand and gravel of exceptionally high quality in ideal proportions for concrete aggregates was discovered and purchased by the contractor about 9 mi. east of the batching plant and 9½ mi. east of the center of mass of the fill for embankment. The plot, 62 acres in area, is situated alongside the tracks of the West Shore Railroad. Train-loads of materials for aggregates and for fill are hauled over these tracks by a New York Central 170-ton freight locomotive manned by a crew of three, as required for operation on a live railroad.



BATTERY of gasoline- and diesel-powered excavators, equipped with 2¼- and 3½-cu.yd. dragline buckets, load seven or eight fifty-car trains per day with 18 to 20 cu.yd. per car.



DUMP CARS discharge fill material into trench excavated alongside track, and crawler cranes utilize material to build single-track embankment to final elevation of fill. Dump trains then operate on track laid on this embankment to widen out fill to final dimensions.



NICKEL STEEL GIRDER is set in position at 110-ft. Salina St. bridge by two railroad derrick cars. Narrow right-of-way in heart of city compels use of only two girders, instead of four, to carry three tracks. High-strength steel is required to hold girders within practicable limits.

FOR RETAINING WALLS *(right)* contractor builds panel forms averaging 450 sq.ft. in area, reinforced with 4-in. steel channel wales.

A compact crushing, screening, and washing plant at the pit produced 1,100 cu.yd. of sand and gravel each day last summer without breakdowns or other difficulty.

Sand and gravel were uncovered at the pit under about 18 in. of top-soil. During the period of high production by the plant, raw materials were dug by a 2-yd. dragline and delivered to a track pit at the foot of the first plant conveyor by 40-yd. bottom-dump cars moved by an 8-ton gasoline dinkey. The plant provides crushing and screening and washing facilities at separated levels, with belt conveyors to carry the raw material from one point to the next. A 24-in.x 100-ft. belt conveyor transports the material from the track pit to a rotary screen which delivers oversize gravel to a jaw crusher. Crushed gravel and sand are raised from this point by a belt conveyor 20 in. wide and 185 ft. long to the receiving end of a 5x20-ft. rotary washing screen above the bins, which have a capacity of about 200 cu.yd. Four electric motors drive the conveyors, crusher, and screens. To remove from the gravel any silt that may settle in the bottom of the bin, the material is given a final washing by a pair of spray bars as it passes down the discharge chute from the bin to the cars. The discharge chute has a wire-screen bottom which permits the wash water to escape.

Last summer sand and gravel were hauled to the batching plant in trains of Western 12-yd. side-dump cars, of which the contractor has 165 on the project. This year the side-dump cars are needed for placing fill, and the sand and gravel are being delivered to the new set-up of the batching plant in gondola cars which can be unloaded by clamshell.

Loading Fill Material — Side-boards have been added to the 12-yd. cars to increase their capacity under heaped load to 18 or 20 cu.yd. Three fifty-car trains are kept in constant operation between the pit and the fill. The 170-ton freight locomotive shuttles back and forth without interruption between the two ends of its run, taking a loaded train to the fill and bringing back an

GRAVITY - TYPE WALLS *(right)* and abutments are designed to retain sand and gravel fill on narrow right-of-way through heart of Syracuse. In foreground may be seen double tracks of former West Shore main line.

PRECAST CONCRETE CRIB WALL is constructed to retain railway embankment adjacent to industrial siding.

BRIDGES AT 26 LOCATIONS are involved in track relocation and grade crossing elimination project in Syracuse, N. Y. Including bridge abutments, wing walls and intermediate retaining walls, project requires about 130,000 cu.yd. of concrete. Batching plant set up at central location noted on this plan serves fleet of five 4-yd. truck mixers during 6-month concreting season in 1934, when mixers delivered 103,000 cu.yd. to structures scattered throughout 5-mi. length of improvement.

empty one each trip. At the fill, two 50-ton steam locomotives belonging to the contractor break up the trains and handle shorter units of ten to twenty cars while they are being dumped.

A battery of three crawler draglines moving in sequence along the row of standing cars loads the empty train at the gravel pit. The dragline battery is made up of two gasoline excavators equipped with 60-cu.ft. buckets and a diesel machine between them swinging a 3½-yd. bucket. A single spur track laid parallel with the edge of the cut and connected to the West Shore tracks brings in empty trains for the draglines to load. A delay in their work occurs each time a loaded train is taken out and an empty train put in its place. In spite of this loss, the three machines load seven or eight trains each day. The smaller draglines load ten to twelve buckets to a car, and the large unit loads six.

To obtain sufficient sand and gravel for 1,770,000 cu.yd. of fill from the 62-acre plot, the contractor is digging to 40 ft. below the surface of the ground and 25 ft. below water level. Holes were burned in the backs of the dragline buckets to permit drainage of water and enable the buckets to scoop a greater pay load. The loading track is shifted 55 ft. at a time. Before shifting the track, the contractor sends the draglines to the far side of several trains to strip the overburden to a depth of 5 ft., uncovering a foundation of clean, hard sand and gravel for the track and for the crawler excavators. A tractor bulldozer levels this gravel strip for railway and draglines. Shifting the track takes a full day. The level gravel strip makes an excellent roadway for the crawler excavators.

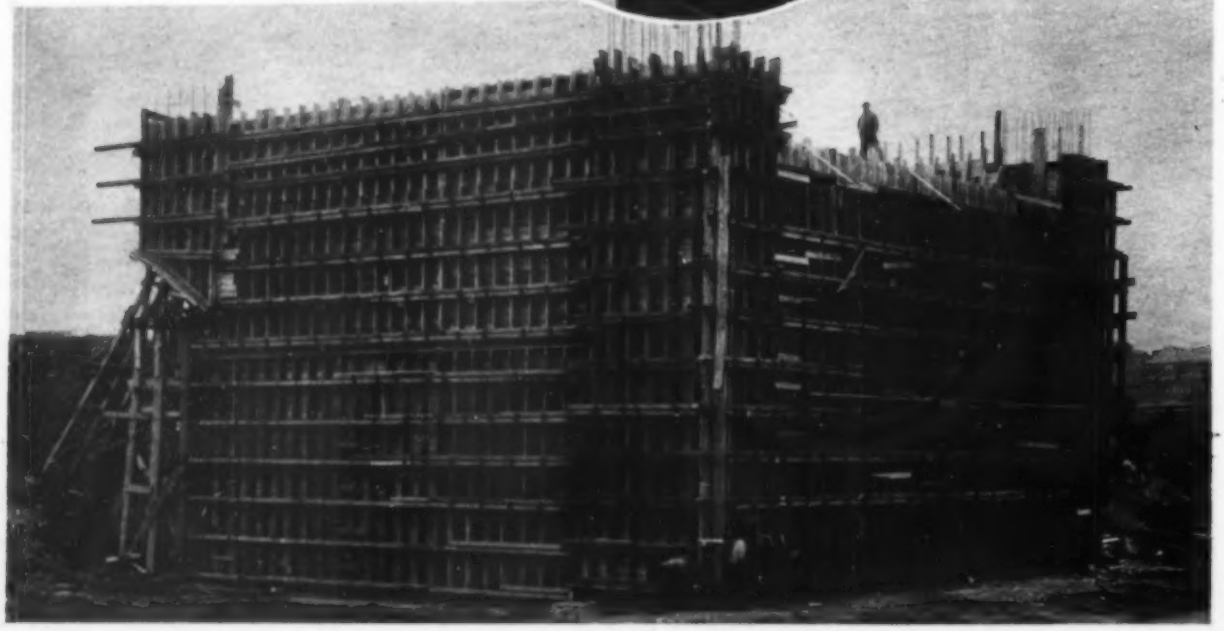
Building Fill—To avoid the expense of constructing a trestle the full length of the 5-mi. embankment, the contractor devised other means of elevating the dump track. In the eastern part of the city, it is possible to pass a delivery track for sand and gravel at street grade around the abutments of uncompleted bridges. Between bridges in this area, the contractor prepared to raise the dump track by having a dragline excavate a ditch perhaps 12 ft. wide and 5 ft. deep along the edge of the track. The first trains dump their loads into this ditch, from which the dragline removes the material and places it in an embankment to carry one track at the final elevation of the fill. Trains are run on this track to widen out the fill to designed dimensions.

At the west end of the city, where the old West Shore tracks had crossed the streets on bridges, temporary trestles were built to carry the fill track across streets between sections of existing embankment. To increase the height of the old embankment by 15 or 20 ft. without building dump trestles, the contractor lays the construction track close to the edge of the embankment and dumps fresh material down this slope as far as right-of-way limits permit. A dragline on the existing fill uses this material to build up a one-track embankment to designed elevation along the opposite edge. Dump trains on the elevated track then widen out the new embankment to three-track width.

Four or five gasoline crawler cranes have been operated on the work in the city for various purposes such as excavating footings, placing concrete, and casting fill. When handling fill, the machines are equipped according to size with dragline buckets of 1½- to 2-yd. capacity.

CELLULAR TYPE OF ABUTMENT (erected on reinforced-concrete mat resting on cast-in-place piles driven in soft ground at Hiawatha St.) is designed to permit fill material of railroad embankment to flow into cells of structure and assume natural slope under deck of abutment without exerting any overturning moment on face wall.

JAMES SMALL *(in circle)*, field superintendent, is in active charge of operations for Walsh Construction Co., under general direction of David Small, vice-president.



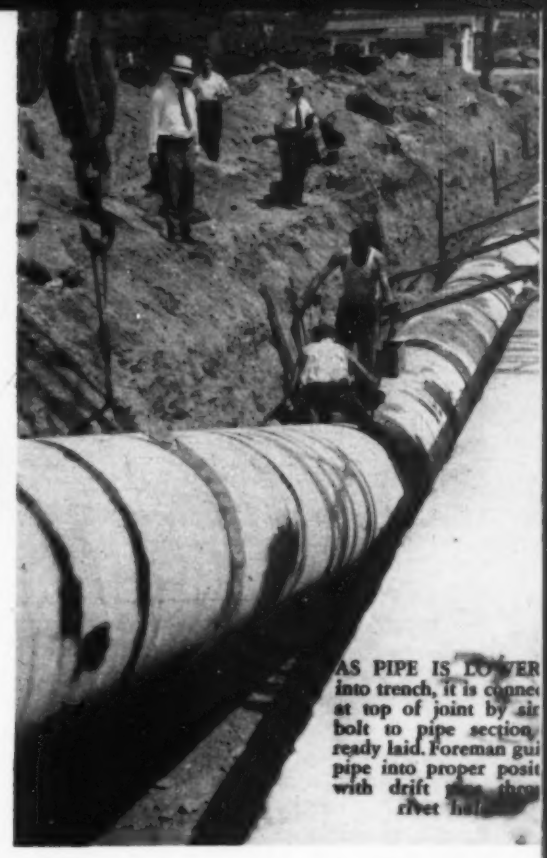
FORM CONSTRUCTION for cellular abutment at Hiawatha St. utilizes timber sheathing, studs and wales. Abutments of this type at west end of city range in height from 35 to 40 ft., measured from bottom of footing mat to base of rail. Forms in contact with exposed concrete surfaces are lined with composition board to reduce finishing costs.

Contract Value and Progress—A contract for the bridges and grading was awarded to the Walsh Construction Co. in December, 1933. The contractor began major concreting operations in May, 1934. Completion in August, 1936, is specified by the contract, but the contractor probably will complete the work several months in advance of this date. Track laying and signal work will be executed by the railroad's own forces. The railroad engineers hope to have the new line in operation sometime during the latter part of 1936.

Administration — Design and construction of the Syracuse improvement are under the executive supervision of J. W. Pfau, chief engineer of the New York Central Railroad Co., whose local representative on the work at Syracuse is A. D. Duffie, assistant engineer. The interests of the City of Syracuse and the local interests of the State of New York are handled by a commission, known as the Syracuse Grade Crossing Commission, of which John T. O'Brien is chairman and Nelson F. Pitts is chief engineer. For the Walsh Construction Co., David Small, vice president, is in charge at Syracuse, assisted by James Small, field superintendent, Fred B. Smith, office manager, and H. H. Dugan, engineer.

40-FT. LENGTH of 48-in. steel pipe is laid in rock trench and telescoped into adjacent section of 49-in. pipe, forming lap joint.

Mile of 48-Inch Steel Main *Taps Shaft of Catskill Aqueduct Tunnel*



AS PIPE IS LOWERED into trench, it is connected at top of joint by air bolt to pipe section already laid. Foreman guides pipe into proper position with drift pins, then rivet holes.

TO provide additional water supply for a section of the Bronx which lacks adequate pressure during periods of peak loads, the Atlas Water-Work Corp., of New York, is laying 6,770 ft. of 48-in. electrically welded steel main, with lap-riveted circumferential joints, in Gun Hill Road, from shaft 4A of Catskill Aqueduct tunnel No. 2 for the Department of Water Supply of the City of New York. The main is made up of 30-ft. lengths of alternate 48-in. and 49-in. I.D. steel pipe laid in a trench cut in hard Manhattan schist and covered with a minimum of 4 ft. of earth below the subgrade of the pavement. Pipe for the main is fabricated in the McKeesport, Pa., shops of the National Tube Co., of ½-in. steel plate with two longitudinal butt-welded seams. A subcontractor, the Spin-Bow Construction Corp., of Brooklyn, lays the pipe and rivets the lap joints.

Trench Excavation—After demolishing the pavement with pneumatic concrete breakers and removing the broken slab and earth overburden to rock with clamshell buckets, the contractor excavates the hard schist by the benching method, drilling four vertical holes 6 to 8 ft. deep to the subgrade of the trench in a transverse row about 2½ ft. back from the face. These holes are loaded with 10 to 20 sticks of 40-per cent gelatin dynamite and are fired simultaneously under a wire-rope blasting mat to break up the vertical slab of rock. After this broken rock has been removed by clamshell and loaded into trucks, the necessary enlarging and trimming to final subgrade are accomplished by drilling four widely spaced holes for about 10 or 12 ft. of trench and loading with sufficient dynamite to break up the remaining rock.

Steel Pipe—Welding of the two longitudinal seams in the pipe is done automatically, the weld metal being protected from contact with air by means of a specially prepared flux. After the pipe is welded, it is rounded up, sized at the ends and punched in pipe form. This method of punching differs from established practice by which plates are punched before they are bent. The pipe then is tested to 300-lb. per square inch hydraulic pressure, and while under pressure is pounded with an 8-lb. hammer.

After the welded pipe has been rounded and tested, it is coated inside and out with a layer of Wailes-Dove-Hermiston bitumastic enamel. Prior to application of the enamel, the pipe surfaces are given a coat of primer solution. The hot bitumastic enamel is poured inside while the pipe is rotated at high speed, and the outer coating is applied by hand at a slower rotating speed. This outer coat is covered at the shop with an application of whitewash to protect the enamel and reflect the rays of the sun, reducing the absorption of heat and resultant expansion of the pipe. Inner and outer enamel coats extend to within 12 in. of the end of the pipe. The joints are coated with enamel after riveting and caulking.

Pipe sections are numbered at the shop for consecutive laying in the trench, and 60 rivet holes 15/16 in. in diameter for each joint are punched

IN CHARGE OF CONSTRUCTION. Anthony Soraci, president, Atlas Water-Work Corp.; Gerald A. O'Grady, inspector, Department of Water Supply; Frank D. Zuzzolo, contractor's engineer; and Fred C. Stein, Jr., engineer, Department of Water Supply.

STEEL PIPE of 48-in. and 49-in. inside diameter fabricated with two welded longitudinal seams is coated at shop with inner and outer lining of bituminous enamel, extending to within 12 in. of ends of pipe. Outer coating in given protective layer of whitewash. Crawler crane handles 30-ft. pipe sections into trench.

STEEL DRIFT PINS *(left)* are driven through rivet holes around circumference of joint to hold lapping pipes in accurate position through all temperature changes until joint is bolted.

at equal spaces around the circumference 1⅜ in. from the ends of the pipe lengths, this distance being measured to the center of the hole. After a joint has been bolted in the field, the subcontractor reams the holes to 1 1/16-in. diameter and countersinks them on the inside to a maximum depth of 5/32 in. The joints are closed with 1-in. cone-head rivets driven by pneumatic hammers on the inside of the pipe, with the bucker-up working on the outside.

Pipe - Laying — Four 30-ft. pipe lengths are tied together by steel straps on a flat car and are shipped by rail to a siding about 2 mi. from the east end of the project, where a crawler crane stacks them temporarily in double tiers on timber saddles. The same crane loads two pipe sections on to a stake-body truck for transportation to the job, where the pipe is strung on the pavement along the line of the trench.

In connecting adjacent pipe sections in the trench the Spin-Bow Construction Co. uses five forks, or tapered teeth, which are pinned and keyed to rivet holes in the invert of the pipe already laid, as illustrated by one of the photographs. The next pipe section is handled into the trench by a crawler crane. While tilted at an angle, this pipe section is pinned and fastened by a single bolt at the top of the pipe to the adjacent section in the trench. With the aid of the five forks, the end of the suspended pipe section is guided into position either inside or outside the section previously laid. As the ends of the two pipes approach contact, a workman inside the pipe unbolts the five forks, and the suspended section is lowered to a horizontal position with the two ends overlapping around the full circumference of the joint. Workmen outside the pipe drive steel drift pins through matching rivet holes to maintain a rigid connection. Sufficient pins are driven around the circumference of a joint to hold the rivet holes in perfect alignment through all changes of temperature until the joint is bolted for riveting.

Before riveting a joint the subcontractor draws the adjacent surfaces of the two lapped pipes into close contact by bolting every other hole. This bolting increases the cost of the preliminary work but is claimed to gain an eventual saving because it practically eliminates the chances of leaks at the joints when the main is put under test. Riveting usually is carried one-quarter to one third of the distance around the circumference before the intermediate bolts are removed and these holes closed by rivets. Instead of an ordinary bucking-up tool, the bucker-up uses a dolly hammer with the handle thrust through the loop of a chain wrapped around the pipe, as illustrated by one of the photographs.

After riveting, the joints are caulked with pneumatic tools. Both inside and outside pipes have edges beveled 20 deg. for complete circumferential caulking. Rivets also are caulked, and the beads on inside rivet heads are ground flush at all contact surfaces.

Progress—As the water main is being constructed with a loan and grant from the Federal Emergency Administration of Public Works, workmen are limited to 30 hr. work per week. The general contractor employs two 6-hr. shifts for five days each week, Monday to Friday inclusive. When a sufficient amount of pipe has been lined up for laying, the subcontractor also works a day of two 6-hr. shifts. In a 12-hr. day, the two shifts lay and rivet an average of 300 ft. of pipe.

Personnel—Plans and specifications for the water main were prepared under the general direction of Joseph Goodman, acting chief engineer of the Department of Water Supply, Gas & Electricity. William Flannery, mechanical engineer of the department, is responsible for pipe design and for the approval of shop drawings. Construction is being carried forward under the broad supervision of E. J. Clark, borough engineer for the Borough of the Bronx. Fred C. Stein, Jr., engineer, and G. A. O'Grady, pipe-laying inspector, represent the Department of Water Supply at the site. William G. Shea is resident engineer-inspector for PWA.

For the Atlas Water-Work Corp., Anthony Soraci, president, directs the work on the project. Frank D. Zuzzolo is engineer on the project for the general contractor. For the Spin-Bow Construction Corp., subcontractor, Dominick Spinella and C. A. Bowerman, members of the firm, are actively in charge of pipe laying and riveting.

TO ELIMINATE POSSIBILITY of leakage at joint *(left)*, contractor draws pipe surfaces into contact by bolting every other hole before starting to rivet joint.

FIVE TAPERED FORKS *(right)*, fastened to invert of pipe already laid in trench, guide end of next pipe section into position.

ROLLING TOOL SHED *(left)* carries supplies for Spin-Bow Construction Corp., in which Dominick Spinella (at left) and C. A. Bowerman are officers.

BUCKER-UP *(right)* uses dolly hammer with handle caught in chain loop to buck up rivets driven from inside of pipe.

SECOND OF A SERIES OF ARTICLES

Planning and Plant for

HEAVY CONSTRUCTION

Principles and Practices of Job Layout and Selection and Use of Equipment for Large Dams and Appurtenant Works

By ADOLPH J. ACKERMAN *and* CHARLES H. LOCHER
Construction Plant Engineer *Construction Consultant*
TENNESSEE VALLEY AUTHORITY, KNOXVILLE, TENN.

. . . 2 . . .

Preparatory Work
Access to Job
Camp Buildings

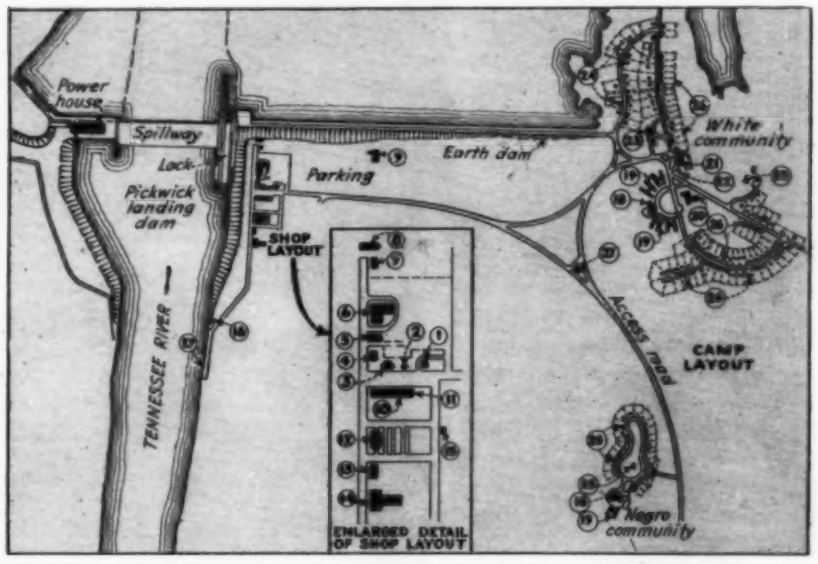
STARTING THE JOB.—"Don't start too soon" is just as important as the warning "Don't get caught with a late start." When the advance guard gets on the job the overhead starts. Planning the start means to find out when enough operations are lined up to keep the job going without a hitch and at the same time justify the ever-present overhead expense. If the starting date is set to take full advantage of favorable conditions and definite commitments are made as to arrival dates of construction plant and personnel, and if the key foremen are all familiar with the general program, the job can get started with a "bang."

What this means is best illustrated by the following piece of bunk-house

"A modern construction job probably depends on no single camp feature more than upon the dining or mess hall. No matter how rough the day's work, the average construction man is not disposed to complain as long as he can sit down to three square meals a day."

gossip between two shovel operators: "Tom, this is going to be a real job. The old man sure knows what he's doing. We've been here only two days and he's lined up boarding places, one bunk-house is finished and the cook-house is running .The shovels were waiting for us at the siding, and as soon as we get the road cut finished he'll have enough clearing done at the dam to start stripping the dirt off the rock. The air compressor arrives tomorrow and by the time it's set up the power line will be in and we should be ready to start on the rock."

"Yeah, what difference from old man Evans' job last year. He told us to be in Elkmont on March 10 to take the shovels off the flat cars and when we got there he had found out that they wouldn't go through one of the tunnels, so they had to ship them all the way around. On top of that, he left the spare parts behind and the first day of work a sprocket gear broke so we had to wait for a new one. When we got started at the dam he didn't have enough men to keep ahead on the clearing and we only ran the shovels one shift. The first bunk-house wasn't ready for three weeks and I didn't have a square meal for a month. We never got going on that job."



CONSTRUCTION CAMP AND SHOP LAYOUT at Pickwick Landing dam in Tennessee. Camp site is in wooded area above high water and shops are adjacent to construction operations.

SHOP LAYOUT: (1)First-aid station. (2)Lunch room. (3)Time office. (4)Small tool house. (5)Garage repair shop. (6)Machine and blacksmith shop. (7)Electricians' shop. (8)Compressor house (9)Switch house and sub-station. (10)Warehouse. (11)Riggers' shop. (12)Office. (13)Testing laboratory. (14)Carpenter shop. (15)Reinforcing yard office. (16)Derrick-barge landing. (17)Ferry landing.

CAMP LAYOUT: (18)Cafeteria. (19)Dormitories. (20)Community building. (21) Store. (22)Fire station and camp manager's office. (23)Hospital. (24) Permanent houses for operators. (25)School. (26)Workmen's cottages. (27)Filling station.

Access Roads—Until a few years ago most construction superintendents thought only in terms of railroads in considering means of access to the site. On certain projects this may still be the most economical system, but the modern heavy duty highway equipment and special trailers with capacities of 100 tons or more can meet practically every job demand. Cement, which is usually considered the major item of traffic for a large dam, can be hauled economically over the highways, in some cases over distances ranging up to 40 or 50 mi., depending upon nearby railroad facilities and topography of the region. In remote cases hauling distances may be many times greater.

The construction of access highways, when of considerable length, can generally be handled most economically by a specialist in this class of work. However, on short stretches and in remote regions, it is frequently possible to select equipment which may later fit into the main job and, while not the most efficient for the immediate purpose, the entire operation may be the cheaper in the long run. In almost every case a large job has a number of smaller appurtenant works which are not located within reach of the main construction plant. For these smaller jobs the more portable pieces of highway construction equipment, such as small gravel or crushing plants, grading equipment, portable air compressors, cement handling equipment, mixing units, etc., frequently offer an ideal plant set-up for a variety of "odd jobs."

The use of inclined elevators down the face of a canyon may occasionally find application, but only in very remote cases.

Layout of Construction Camp—Depending upon the duration and size of the job, considerable effort is warranted in carefully laying out the camp site. An example of what can be done along these lines is given in the illustrations showing the camp at Pickwick Landing dam in Alabama. By curving the streets to fit topography and shade trees and spacing the homes reasonably far apart, every inducement is offered to the tenant to help take care of his lot and contribute to the landscaping of the area. Some general principles to be

"When the advance guard gets on the job the overhead starts."

"Today there is a greater realization of the fact that if the men are permitted to lead a more contented and better balanced life off the job, their efficiency is bound to be greater on the job."

observed in the relative location of the various types of buildings are the following:

The bunk-houses and dining hall should be grouped into one area where the unmarried personnel have reasonable privacy and a minimum of disturbance for those sleeping during the daytime. The school, stores, community building and other facilities should be grouped in so far as possible, to be most conveniently accessible to all inhabitants of the camp without crossing

traffic lanes unnecessarily. The hospital should be located with due consideration to quietness, good air circulation, and quick access from the job to take care of emergency cases with a minimum loss of time. The Pickwick camp can accommodate 550 men in the dormitories and 100 families in 85 temporary cottages and 15 permanent houses. A separate small village for colored employees is provided with one 150-man dormitory, 25 family cottages and a separate school, commissary and small recreational building. The proportions of these facilities were determined from a careful analysis of nearby communities, labor markets, and type and quantity of skilled and supervisory personnel required for the construction program.

Constituting the start of the main job, provision of the necessary facilities for the care of personnel as to food, shelter and comfort, with due consideration for both initial and final costs of complete installation, demands intelligent and deliberate thought. Following award of the contract, detail designs must get under way and construction of the camp must proceed almost simultaneously, expanding, as the demand for use increases, in the following order: (1) Small office building; (2) first section of mess hall; (3) dormitories; (4) family houses.

PORTABLE EQUIPMENT, such as this crushing plant, is useful on preliminary road-building and other types of remote work. Later it may fit into main job operations.

It is frequently the case that a large portion of the installation can be more economically accomplished by contract for the reason that small local contractors in the building line are thoroughly equipped with skilled labor, all necessary tools, and definite information as to just where necessary building materials can be obtained at proper costs and with no delay in delivery to the site.

As a general thing, a certain number of permanent houses are required, after the job is completed, for the operators and other personnel. At Pickwick these houses were built at the beginning of the job to serve temporarily as quarters for construction officials and their location was determined in the general scheme of the village so as ultimately to front on the future lake which will be formed after the dam is completed.

Where such permanent houses are used during construction by the job officials, there is, of course, the possibility of inconvenience during the transition period when the operating force is ready to go to work before the construction organization is ready to disband. Sometimes this period may be quite long. Furthermore, it is likely that the houses may require some reconditioning after two or three years' use by construction forces.

Temporary Houses—In the construction of temporary houses large economies are possible in standardizing the floor plan without sacrificing variety in external appearance. By turning the houses in various directions and modifying the type and location of porches and other simple exterior effects, a pleasing result can be obtained at little extra cost.

A suitable type of cottage for construction camps is indicated in one of the illustrations showing a five-room house approximately 22 x 27 ft., containing two bedrooms, kitchen, bath, living room with a dining corner. The plumbing is arranged compactly in adjoining kitchen and bathroom. All of these details can be retained and the cottage enlarged to seven rooms to develop one additional bedroom and a dining room in a building 22 x 36 ft. for larger families.

In the case of widely scattered jobs involving the construction of long tunnels it is frequently necessary to establish sub-camps near the portals and with them must, of course, go all necessary utilities and other facilities.

Heating System—In a number of camps recently constructed older forms of heating systems have been displaced by electric heaters. Special heaters are now on the market with which even large auditoriums can be successfully heated. In dormitories such heaters are particularly satisfactory because they permit control of temperature in individual rooms, are fireproof, and have a considerably higher salvage value than do other forms of heating in the size required for this type of camp structure.

CONSTRUCTION HIGHWAY for heavy-duty trucking replaces railroad in providing access to large project by means of truck and trailer.

Dormitories—The housing of large groups of men on major construction projects has undergone marked improvement during the past decade. The bunk-house of older days was generally regarded as a temporary structure with only a few years of service and was, therefore, erected with a minimum of necessary facilities. As a general thing such bunk-houses consisted merely of walls, floor and roof inclosing a considerable area and equipped with long rows of double-deck beds. Sleeping conditions were not so bad in summer, with all windows open, but when winter came along it was no easy matter to obtain a unanimous vote to keep the windows open during the night while a lone stove at the center of the room was attempting to radiate its heat to all parts. The circle of soggy boots and heavy socks carefully stacked around the stove for drying over night didn't help the ventilating situation. In those days an expenditure of $100 per man for living quarters was considered high.

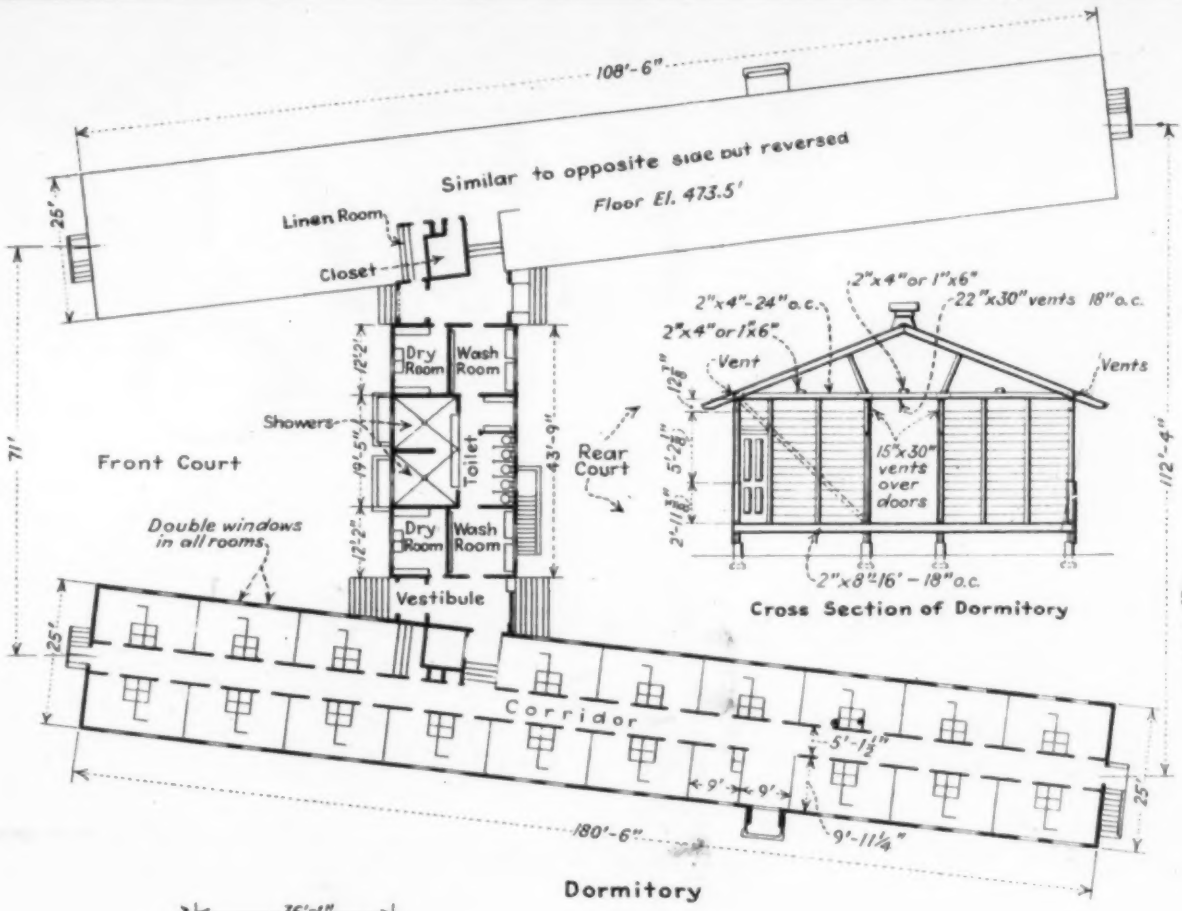
The more recent large-scale construction projects have required a more permanent type of structure with better facilities, for which the name "dormitory" is quite appropriate. Now, there is a greater realization of the fact that if the men are permitted to lead a more contented and better balanced life *off* the job their efficiency is bound to be greater *on* the job.

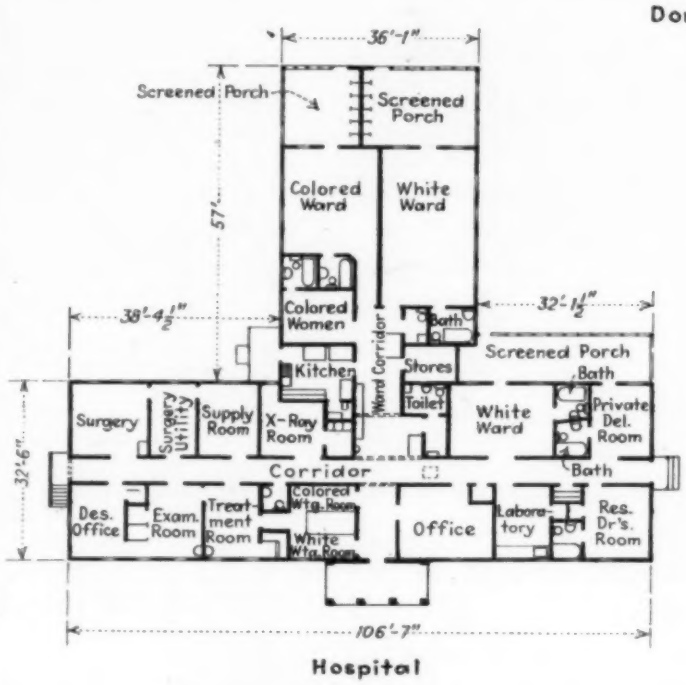
It was at one time common practice to make bunk-houses self-liquidating, and, of course, this required the cheapest kind of construction. More recently, however, the attitude is that increased expenditures for good living quarters can be repaid through greater output and efficiency on the job. A mechanic who has been connected with a construction job for two years has probably earned $3,000. Even a 5-per cent reduction in his efficiency would mean a loss of $150 to the contractor. Other things being equal, it is not difficult to visualize an improvement of 5 to 15 per cent in a man's efficiency over his "indifferent" rate of output, provided his habits of living off the job are such as to keep him in a healthy state of mind.

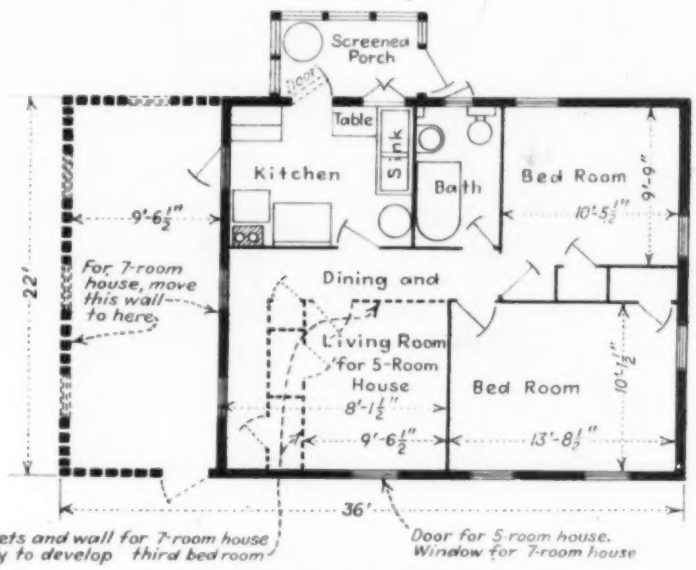
In modern camps an expenditure of $200 to $250 per man is not considered excessive and this sum easily provides for individual rooms, or at least separate rooms for every two men. Improved heating facilities in the winter and air-conditioned ventilating systems for the summer are of extreme importance in providing adequate sleep and rest so that a man returns to the job fully refreshed for another day's work.

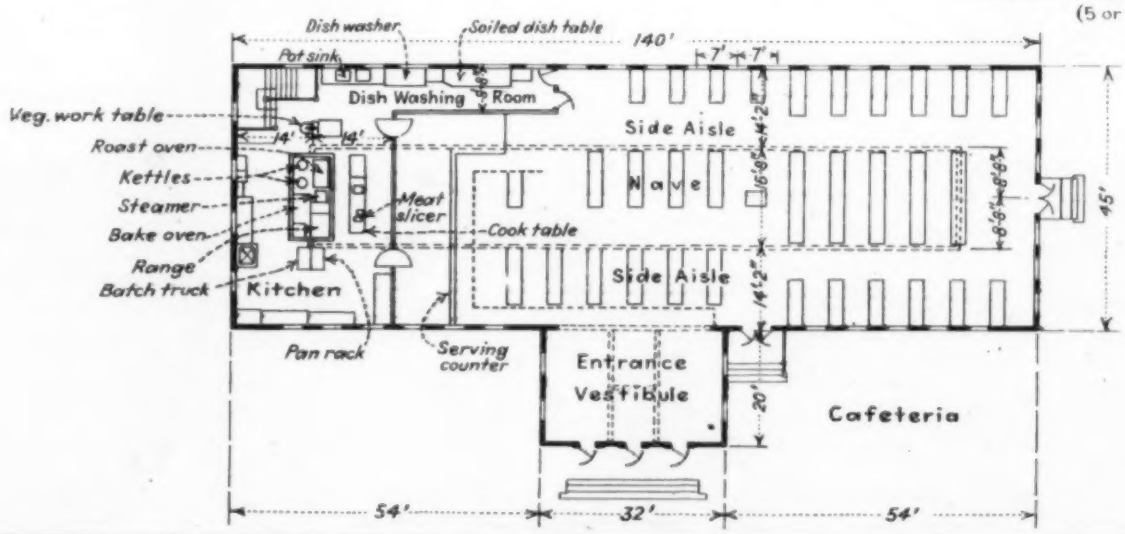
In some camps the dormitories are sufficiently large to house 100 to 150 men per building, while in other camps they are kept down to a capacity of 30 to 40 men. This depends to a great extent upon local conditions, arrangement of washroom facilities, fire hazards, segregation of groups of men by shifts so that men sleeping during the daytime are not disturbed by the usual traffic and noise of the rest of the men.

It is important to recognize the prin-

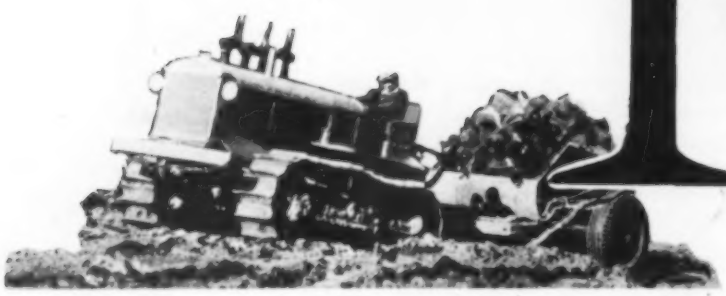

108'-6"
Similar to opposite side but reversed
Floor El. 473.5'
Linen Room
Closet
Dry Room
Wash Room
Showers
Toilet
Front Court
Rear Court
Dry Room
Wash Room
Vestibule
Double windows in all rooms
Corridor
180'-6"
Dormitory
2"x4"-24" o.c.
2"x4" or 1"x6"
2"x4" or 1"x6"
22"x30" vents 18" o.c.
Vent
Vents
15"x30" vents over doors
2"x8"-16'-18" o.c.
Cross Section of Dormitory
Screen hinged here
Screen
Hinge
Sheet metal sill in open position for operating window
Windows stored below sill
Disappearing Window Details


36'-1"
Screened Porch
Screened Porch
Colored Ward
White Ward
Colored Women
Ward Corridor
Bath
Stores
Kitchen
Toilet
Screened Porch
Bath
White Ward
Private Del. Room
Bath
Surgery
Surgery Utility
Supply Room
X-Ray Room
Corridor
Colored Wtg. Room
White Wtg. Room
Des. Office
Exam. Room
Treatment Room
Office
Laboratory
Res. Dr's. Room
57'
38'-4½"
32'-1½"
32'-6"
106'-7"
Hospital


Screened Porch
Table
Sink
Kitchen
Bath
Bed Room
Dining and
Living Room for 5-Room House
Bed Room
For 7-room house, move this wall to here.
22'
9'-6½"
10'-5½"
9'-9"
8'-1½"
9'-6½"
13'-8½"
10'-1½"
36'
Closets and wall for 7-room house only to develop third bedroom
Door for 5-room house. Window for 7-room house
Construction Camp House
(5 or 7-rooms)


Dish washer
Soiled dish table
140'
Pot sink
Dish Washing Room
Veg. work table
Roast oven
Kettles
Steamer
Bake oven
Range
Batch truck
Kitchen
Meat slicer
Cook table
Side Aisle
Nave
Side Aisle
Pan rack
Serving counter
Entrance Vestibule
Cafeteria
45'
54'
32'
54'
Construction Camp Buildings

"Tough

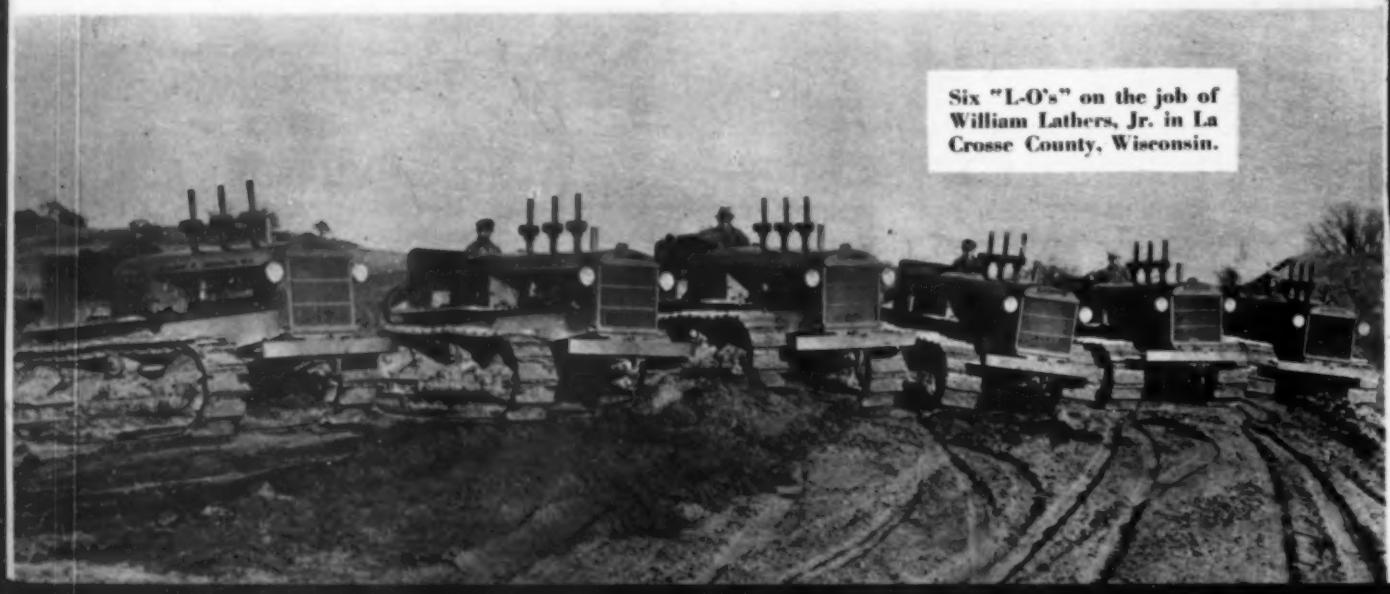


But My 6 'L-O's' Cut Costs and Increased Yardage"

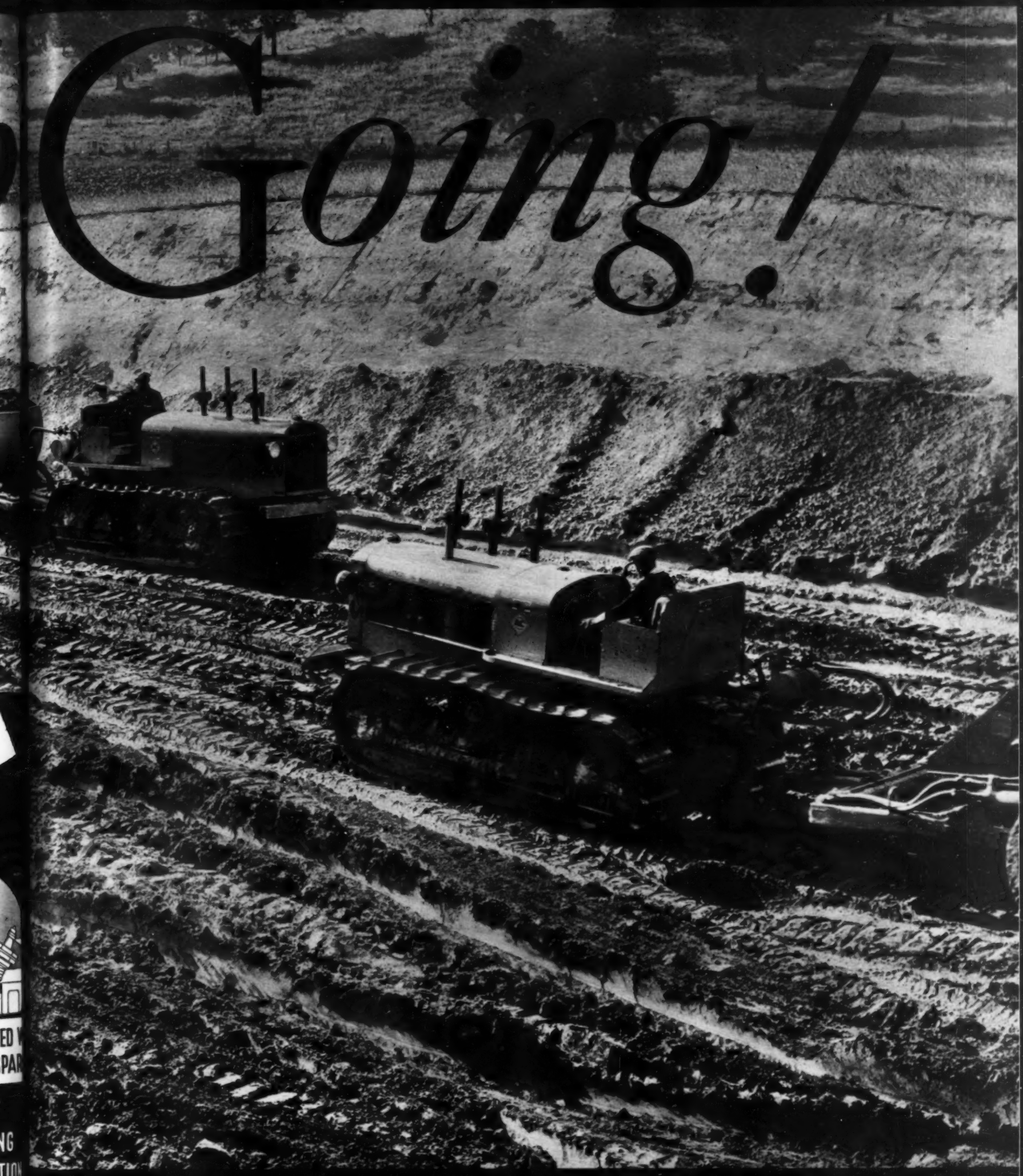
— — — *says William Lathers, Jr.*

"I like my 6 'L-O's'," says William Lathers, Jr. "Their performance on my La Crosse County (Wis.) job has convinced me they are A-1 tractors. They have cut my fuel costs and have increased my daily yardage because they have more power. Pulling 8-yard scrapers in the soft ground we have encountered on this job, is mighty tough work and an excellent test of tractor dependability. I made no mistake when I chose A-C Oil Tractors."

This is a conservative example of the way contractors praise the Allis-Chalmers Oil Tractor. "L-O's cut my costs in half"... "Best balanced tractor I ever used"... "Easier starting"... "Easier to maneuver"... are typical comments. All this points to one obvious conclusion—the most advanced design in tractor engines today is the A-C low compression Oil Engine ... in which Diesel fuel is injected into the combustion chamber with a Diesel pump and ignited with time-tried electrical ignition. The result is Diesel fuel economy .... with gasoline engine simplicity.



Six "L-O's" on the job of William Lathers, Jr. in La Crosse County, Wisconsin.

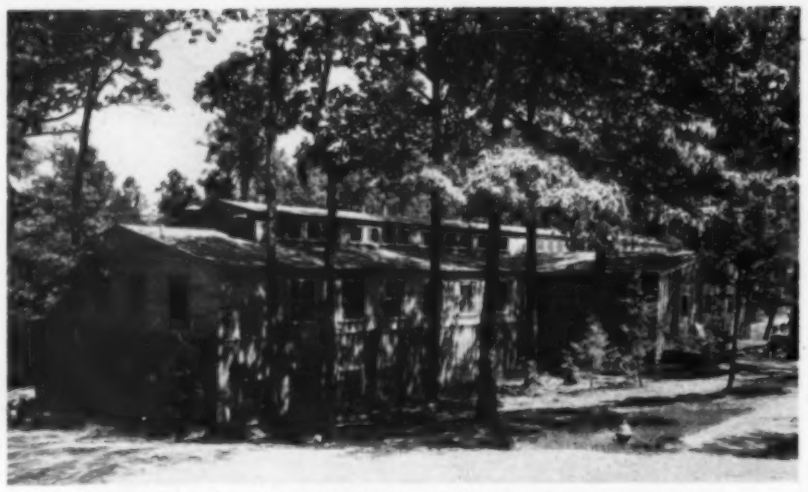


ALLIS-CHALMERS OIL TRACTORS

TRACTOR DIVISION—MILWAUKEE, U. S. A.

ciple that a man desires and is entitled to live in accordance with the established standards of a home. A recent trip through a modern bunk-house disclosed the following: An electrician in the privacy of his room surrounded by books of high grade literature and so-called "high-brow" periodicals which to him were a source of considerable satisfaction and diversion; here and there mechanics and carpenters studying blue prints and improving their ability to read them; a carpenter building a small model of the dam on which he was employed; in another room a mechanic making a paper weight and carving on it an outline of the dam; in other rooms a considerable number reading magazines or books for pastime and restfulness while a game or two of cards held forth in other rooms without disturbing the rest of the occupants of the dormitory. Needless to say, the job was going well.

Quarters for Engineers and Foremen—A "staff" house is necessary on a large construction job, with individual rooms for engineers and foremen, and usually with some additional facilities for carrying on their spare time interests and doing a certain amount of planning of their work. This group is also accustomed to good living facilities for which they are willing to pay a higher rental. Such a building may approach a hotel in general layout and include kitchen and dining hall where a more expensive meal is served and of a type more consistent with the needs of office personnel and those engaged in less strenuous physical activities.



DINING HALL AND KITCHEN at Pickwick Landing camp has capacity of 300 men.

Dining Hall—A modern construction job probably depends on no single camp feature more than upon the dining hall or mess hall. No matter how rough the day's work, with driving rain, blistering heat or wintry cold, the average construction man is not disposed to complain as long as he can sit down to three square meals a day. But let the standard of the meals go down and develop into a too frequent repetition of pork, watery potatoes, thick gravy, prunes or some stronger laxative dessert, and things can go pretty bad. For this reason it has been generally recognized that a kitchen and mess hall should contain all of the most modern facilities, high standards of sanitation, refrigeration of perishable foods and last, but not least, a first-class staff of chefs and cooks.

At Norris, Wheeler and Pickwick Landing dams a cafeteria-type of dining hall was constructed and this system has operated reasonably successfully. On Western projects direct table service is almost universally employed. Both systems have their merits; selection depends largely upon local conditions

TYPICAL CONSTRUCTION CAMP FACILITIES

Type of Building	General Features	Purpose	Dimensions of Typical Buildings	Cost of Typical Units	Representative List of Installed Equipment and Facilities
Permanent Houses	Average size permanent houses with all modern facilities.	Housing for job officials and resident operators.	7 rooms 44x60 ft. 5 to 15 required.	$6,000	Standard home equipment; refrigerator, heating system, etc.
Temporary Cottages	Small houses; compact, portable or demountable; low cost. Temporary construction.	Housing of married supervisory staff and skilled personnel.	5 Rooms 22x27 ft. 7 Rooms 22x36 ft. 50 to 200 required.	$1,000 to $1,500	Bathroom fixtures; kitchen plumbing; lighting; heating, etc.
Dormitories	Rooms about 9x10 ft. corridors; special exits; vestibules; special windows; linen room; toilets. 2 men per room.	Housing of labor.	180x25 ft. (2 wings) 40 rooms in each. 44x22 ft. Wash Room. 3 to 7 required.	$75 to $130 per man	Washbasins; toilets; showers and dry room; Hot-water tank; heating system. Each Room Beds, tables, chairs, lights, closets.
Staff House	Rooms about 10x14 ft.; lobby; shower baths; etc.; dining hall and kitchen.	Housing of foremen, engineers, office men.	140x25 ft. with 40x30 ft. wing for Dining room and kitchen. 1 required.	$250 per man $7,000	Same as in dormitories, but better quality covered by higher rentals.
Girl's Dormitory	Rooms about 10x14 ft.; lobby; water supply, etc.	Housing for teachers, stenographers, clerical ladies.	140x25 ft. 1 required.	$7,000	Same as for staff house, but with meals served in staff house dining hall.
Dining Hall, Kitchen, and Bake Shop	Large hall; Special exits; kitchen; preparation room; storage for meats, vegetables, etc.	Feeding laborers and other workers.	140x45 ft. for 300 seats. 1 or 2 required.	$20,000 with equipment	Dishwasher; floor-scrubbing machine; electric griddles; coffee urns; ranges potato peelers; steamers; refrigerator; slicing machine, bake ovens; meat grinder; dough mixer; cake mixer; utensil racks, etc.
Guest House or Hotel	Small building, 10 or more rooms, with running water, and other hotel features.	Quarters for transients, visiting officials, etc.	70x25 ft. 1 required.	$5,000	Same as in dormitories or typical hotel accommodations.
Community Hall	Auditorium; community area and recreational facilities; library and miscellaneous rooms; toilets.	General service and recreational facilities for the workmen and families.	Auditorium 88x44 ft. Reading and class rooms, 36x 99 ft. Recreational area, 98x40 ft. 1 required.	$35,000	Projection booth; lounge furniture; post office; barber shop; billiard room; offices; soda counter; library; games.
School	Class rooms; office; toilets; play areas.	Educational facilities for worker's children.	100x80 ft. plus playground area. 1 required.	$9,000	Class room—furniture; toilet fixtures—water fountain; playground equipment.
Church	Community church in large camps where other buildings are not suitable.	Church activities for workers and natives of region.	1 required.		Benches; pulpit; altar; other church equipment.
Town Office, Police and Fire Department	Office building and garage annex for fire trucks.	Office for camp manager, police headquarters, space for fire truck, etc.	1 required.	$4,000	Office equipment; alarm equipment; vault; hose and chemical truck.
Hospital	Waiting room; offices; examination room; laboratories; toilets and baths; wards (white, colored, male, and female); private rooms; delivery room; medicine room; stores and linens; X-ray room; supplies for surgical wards; surgery room; porches; ambulance entrance; resident doctors' living room; kitchen.	Examination of applicants, care of injured, and community needs. Operations, disease control, sanitation.	106x32 ft. 6 in. 57x36 ft. wing 1 required.	$20,000	Operating table; X-ray equipment; baths and toilets; kitchen equipment; beds; office furniture; signal system; surgical supplies and instruments; dental equipment.
Commissaries and Store	Typical store building for groceries and meats; dry goods and clothing; drugs and soda.	Trading center.	100x45 ft. 1 required.	$10,000 with equipment	Shelves; counters; soda fountain; meat counters; cold storage; miscellaneous store fixtures.
Laundry	Simple building arranged for laundry equipment.	Cleaning Dormitory and dining hall linens, etc.	44x22 ft. 1 required.	$5,000 with equipment	Washing machine; mangles; ironers; wringers; tubs; baskets; driers, etc.
Garage and Repair Shop Filling Station	Car repair building, concrete floor; open pit; large doors.	Servicing and repairing employees' and transients' automobiles.	40x70 ft. 1 required.	$7,000	Wrecking car; chain falls; automobile rack; gasoline pump; oil tanks; gasoline tanks; air compressor; tools; benches; parts storage.

TYPICAL COTTAGES *(above)* for construction foremen and skilled labor are located in wooded area with wide spacing between units to encourage development of yards. Cottages are portable for transfer to new project.

ON EARLIER PROJECTS *(left)* family cottages of this type, covered with tar paper, were common.

and individual preferences. Considerable judgment is required in determining the proper size of a dining hall. At Pickwick Landing the dining hall is designed for 300 men. On larger jobs, such as Conowingo and Grand Coulee, the dining halls have seats for 1,000 men. The size of a dining hall should not be over-estimated, as it is generally found that staggering of shifts will materially reduce the peak demand. Ample ventilation, both natural and forced draft, adequate entrance and exit facilities, and sufficient space to carry on all operations of preparing the foods are standard requirements. A rather common accessory to the dining hall and kitchen is an ice-manufacturing plant, unless cold storage of food and all community requirements are taken care of by mechanical refrigeration.

Operating a mess hall is not the same as operating a modern hotel or city restaurant. Construction camp operations are highly specialized and require a thorough understanding of the average construction man's philosophy. As a result specialized operators for commissaries and construction camps can be engaged for individual projects. Exploitations and dangers to the tranquility of the job are generally kept under control voluntarily by high-grade camp operators. The contractor usually protects himself by stipulating that for good cause such camp management services may be cancelled within 24 hr. Quite frequently the camp management staff is part of the construction organization, with equally satisfactory results.

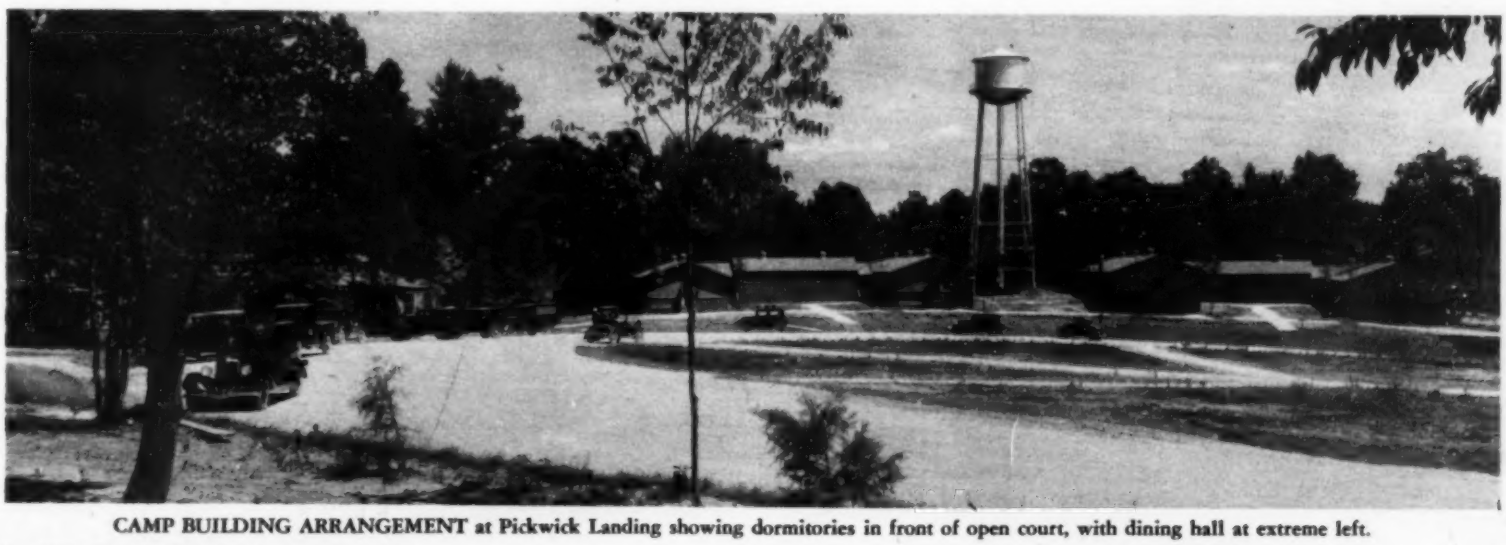
A thorough understanding of what constitutes satisfactory camp facilities is frequently not recognized, as occurred some time ago on a small contract which justified but little expense for camp installation. In this case a timekeeper, who was a rather resourceful individual, was told that if he cared to take over the camp as a side issue, furnish food properly cooked and look after the management, any profit resulting therefrom would revert to him. In a few days there was a general uproar in the camp, and the contractor received a report that the new camp manager had peculiar ideas about cooking everything at one time in one kettle, then beating on an old tin pan and calling, "Come and get it." When approached about these conditions, the camp manager registered surprise over the prevailing dissatisfaction. He assured the contractor that he would keep affairs straight and well in hand—just leave everything to him. He explained that he had been to Chicago the day before, had stopped at the new Great Northern Hotel, one of the finest in the city, and that the guests there were all complaining about the food, too.

A camp manager's responsibility not only includes the housing and feeding of personnel but also purchasing of foods and other supplies in large quantities, controlling sanitation, refuse disposal, camp clean-up and maintenance, operation of a laundry, bake shop, incinerator, fumigating plant and similar facilities. On a large project the personnel for these operations runs from 100 to 200 men. The rentals generally are required to cover operating charges and equipment plus as much of the cost of buildings as is reasonable and consistent with the workers' ability to pay. Operating costs of dormitories range from 10 to 15 cents per man-night. The operation of a large kitchen and dining hall for 24 hr. a day requires from 50 to 70 men on a large project.

Commissaries—Every camp requires the operation of a store for dry goods, groceries, drugs, etc., including hardware and furniture and other commercial operations such as filling stations, transportation services to nearby towns, laundry, garage and repair service for employee's automobiles, bank, post office, etc. As long as such operations are handled by the contractor or by a concessionaire in such a manner as to satisfy the camp residents that they are getting a fair return for their money, the results will be reasonably satisfactory.

❖

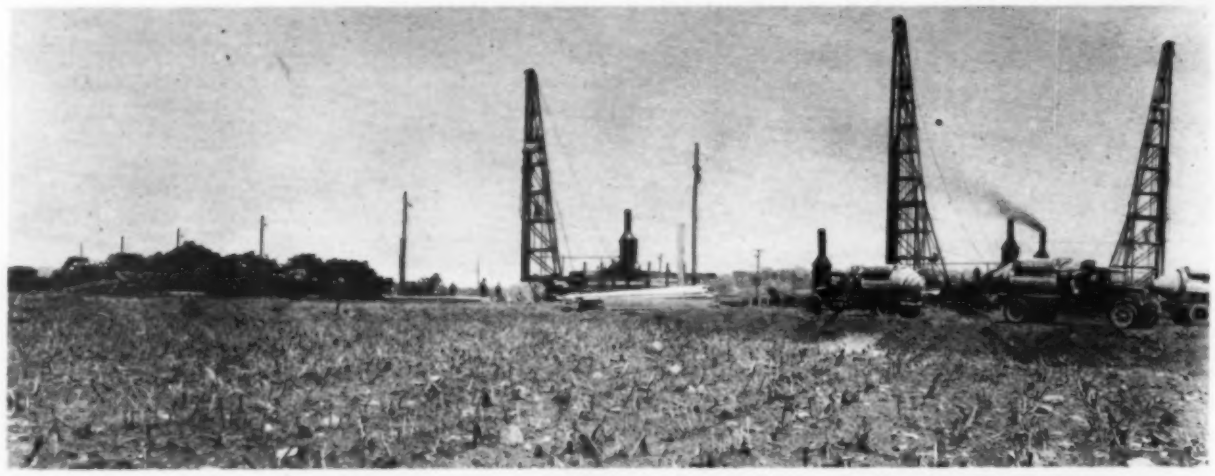
COMING — Because of the publication next month of the Annual Road Builders' Number of Construction Methods it will be necessary to postpone until February Chapter 3 of the series on "Heavy Construction," by A. J. Ackerman and Charles H. Locher. Chapter 3 will continue the discussion of construction camp layout by presenting information on "Shop Buildings and Utilities."



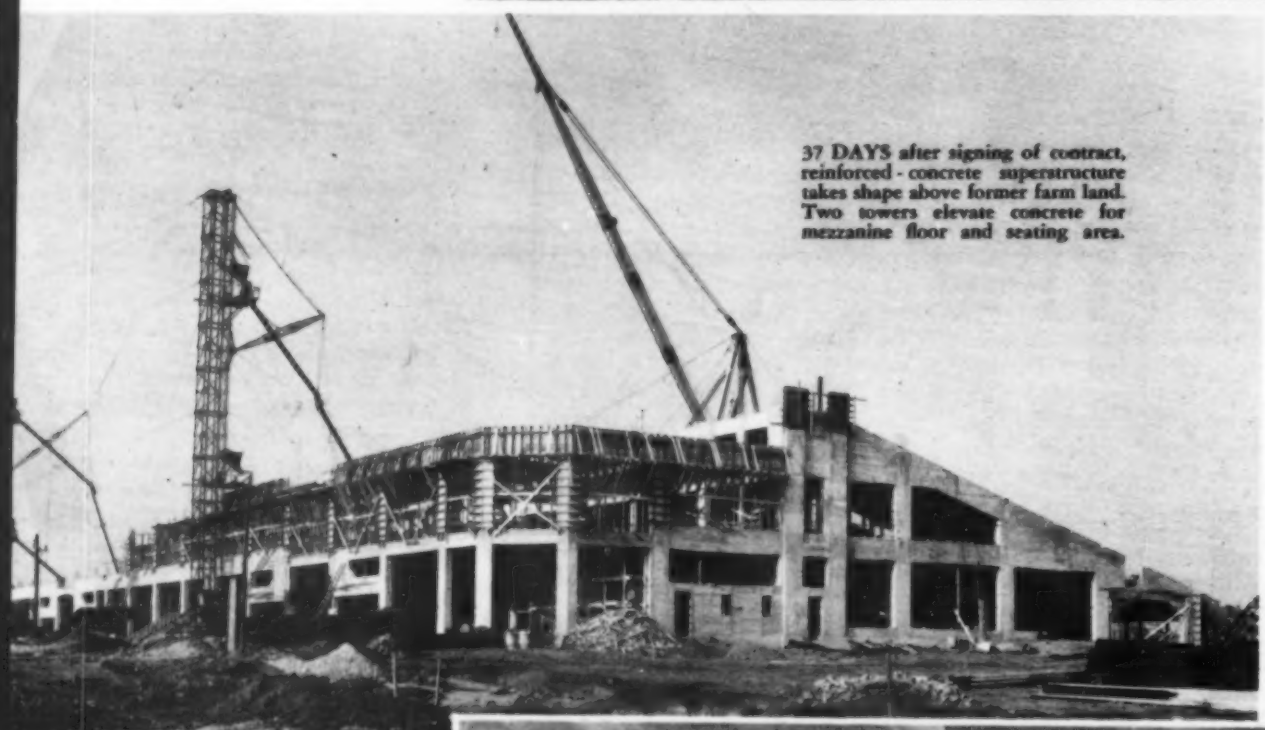
CAMP BUILDING ARRANGEMENT at Pickwick Landing showing dormitories in front of open court, with dining hall at extreme left.

Contractor Steps Fast to Set Race-Track Record

IN a period of 69 calendar days, of which only 46 were working days, the Aberthaw Co., of Boston, contractor, built a reinforced-concrete and steel grand stand seating 11,000 people at the Suffolk Downs race track, East Boston, Mass. A contract was signed May 1, 1935, and all the work was completed July 8. In that time, the contractor drove 1,408 composite piles averaging 70 ft. in length and placed 8,300 cu.yd. of concrete in forms with a total area of 350,000 sq.ft. Construction crews aggregating a maximum of



THREE PILEDRIVERS install more than 1,400 composite piles averaging 70 ft. long for foundation of grand stand. Truck mixers deliver footing concrete.



37 DAYS after signing of contract, reinforced-concrete superstructure takes shape above former farm land. Two towers elevate concrete for mezzanine floor and seating area.

598 men worked 5 days each week. Use of high-early-strength concrete in the superstructure speeded the stripping and re-use of forms. As a result of careful planning, the accelerated construction schedule was carried through to a successful conclusion in ample time for the opening of the track on July 10.

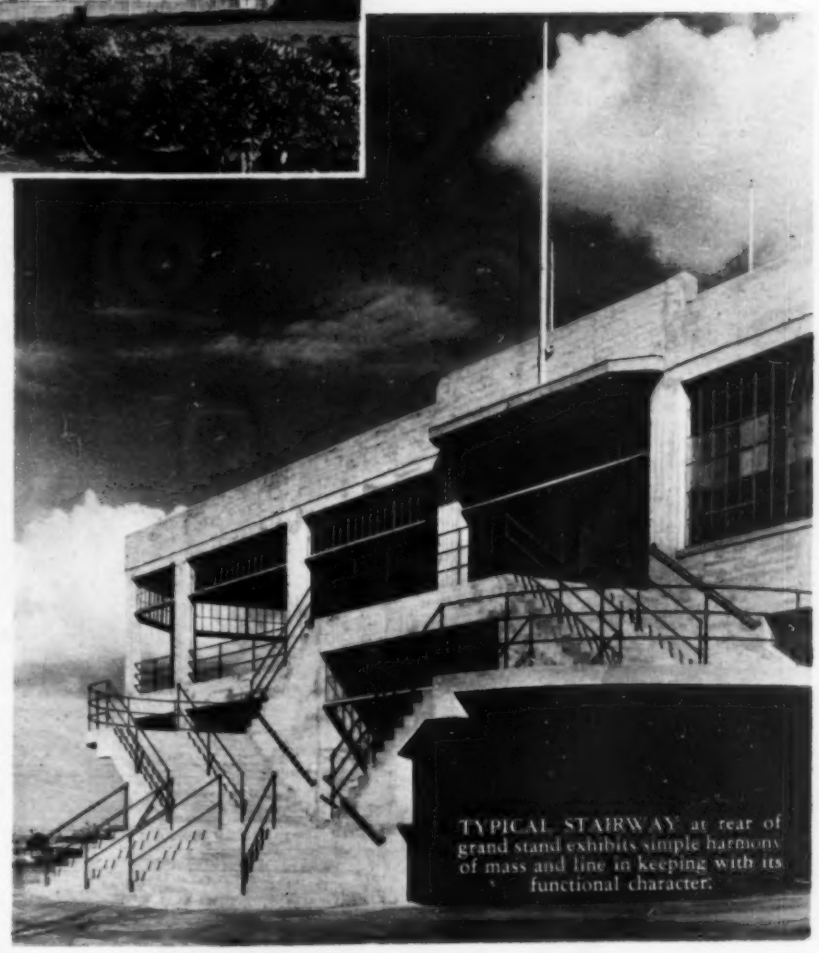
Structural Dimensions—With the exception of steel roof trusses on steel columns, the entire structural frame, walls and mezzanine floor of the grand stand are reinforced concrete. The roof itself consists of wood plank secured to wood nailing pieces on steel purlins and covered with roofing felt. Excluding the projection of the roof at the front, the grand stand is 185 ft. wide by 600 ft. long. The total height, measured from the bottom of the lowest footing to the top of the concrete wall at the back of the seating area, is 68 ft. At the foot of the stand, the seating area cantilevers 10 ft. 8 in. beyond the outermost row of columns. Columns are spaced 25 ft., c. to c., longitudinally and 29 ft., c. to c., transversely. The ground floor is paved with an asphaltic mixture laid on compacted fill.

Foundations and Fill—Three steel-frame roller-type piledrivers put down the 1,408 composite piles averaging 70 ft. in length for the grand stand. As soon as a group of piles had been driven, the piles were cut off about 6 in. above the ground, and footing forms resting on the ground were erected around them. Truck mixers delivered concrete directly to these forms.

As soon as the concrete had set, the

TRAVELING A-FRAME DERRICK resting on steps of seating area erects steel columns and roof trusses. Crawler crane at left handles roof materials.

READY FOR OPENING *(left)* of Suffolk Downs racing season on July 10, just 71 days after signing of contract on May 1. Construction is completed in 46 full working days ending July 8.



TYPICAL STAIRWAY at rear of grand stand exhibits simple harmony of mass and line in keeping with its functional character.

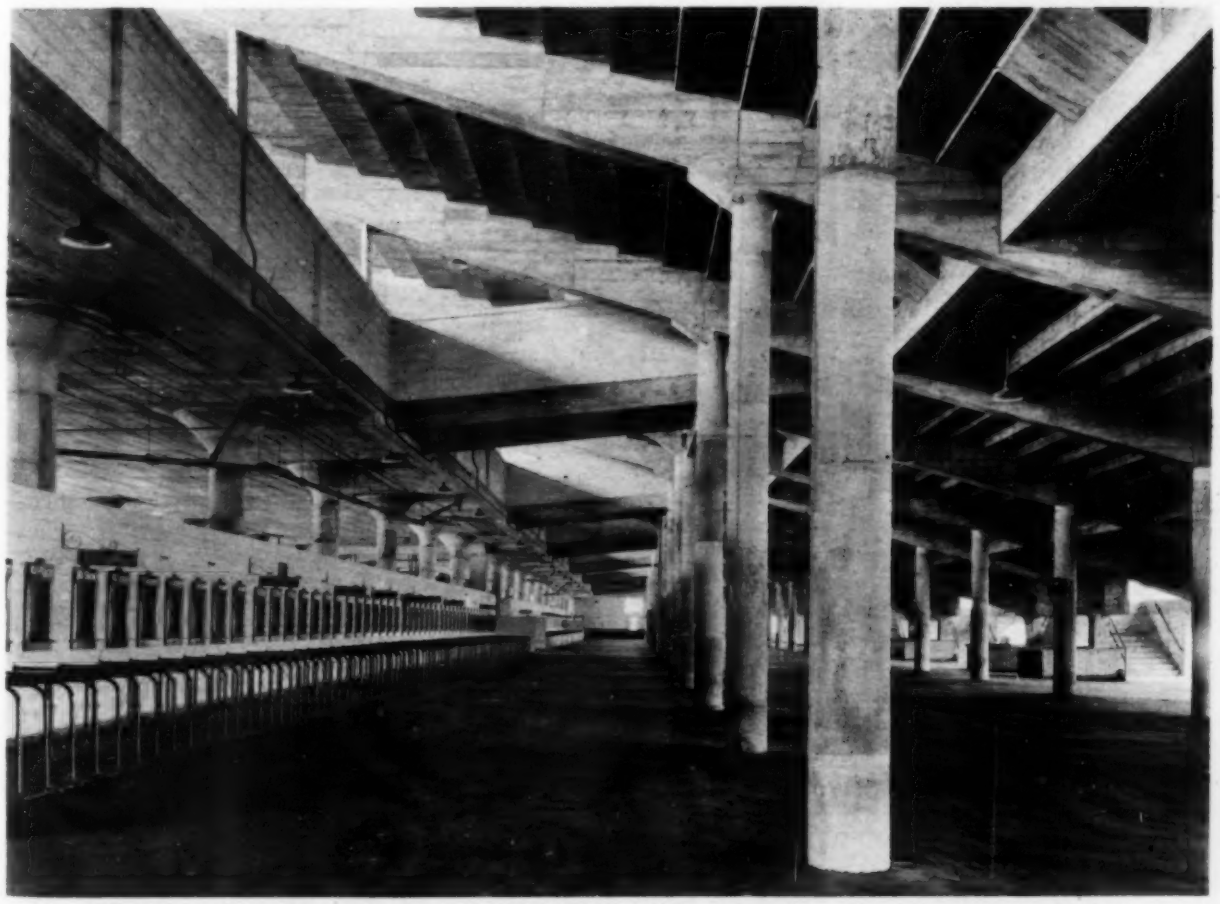
forms were stripped, and the surrounding ground was filled up to the level of the tops of the footings by placing earth in layers and compacting it with tamps and rollers. Column stubs 4 ft. high then were cast on top of the footings, and the fill was carried up to the tops of the stubs, a total average depth for the entire area of 7½ ft. above original ground level. The fill required 40,000 cu.yd. of material.

Concrete Construction—As soon as the fill had been completed over a reasonable area, construction crews laid mud sills on the ground and started erection of forms for the walls and for the mezzanine floor at the rear. This floor was cast on Deslauriers steel forms.

Formwork for the seating area, which consists of a series of steps supported by sloping girders 25 ft. apart, followed as closely as possible upon construction of the mezzanine. Wood forms for the entire seating area, as well as for all walls and beams, were made up in panels for repeated use. In the seating area, forms were stripped 48 hr. after concrete was placed, although shores were left in place 7 days longer.

Ready-mixed concrete meeting definite strength requirements was purchased for all purposes. Footing concrete was designed on 1:2:4 volume proportions and was made with standard portland cement. All other mixtures were designed for definite strength requirements and were made with Incor high-early-strength cement to expedite form stripping. Frequent tests were made to check the uniformity, quality and strength of concrete. The largest amount of concrete placed in one day was 409 cu.yd.

Two steel hoist towers were set up near the quarter points at the rear of the grandstand. Truck mixers of 3½-yd. capacity discharged their loads into large steel hoppers at the bases of these towers. A 1-yd. automatic-dump bucket elevated by a single whip line from a 75-hp. gasoline hoist lifted the concrete from each receiving hopper to a 1-yd. tower hopper from which a chute conveyed it to a floor hopper. On the mezzanine floor buggies transported the concrete from this hopper to the point of final deposit. In the seating area, the buggies delivered to the tops of chute lines extending down the stepped slope. The lines were made up of short lengths of chute of deep U-shaped section. Concreting started at the lowest part of the seating area, and chute sections were removed as the work progressed upward.



INTERIOR of grand stand provides rows of windows for placing bets under pari-mutuel system. Ground floor is paved with asphalt.

Roof- Erection—To set steel columns and roof trusses, a traveling A-frame derrick was set up on timbers resting on the concrete at one end of the seating area. The derrick moved to the other end as rapidly as progress of concreting and steel erection permitted. As each purlin was riveted, a wood nailing piece was secured to it with bolts, and planks for the roof were fitted and spiked into place. A crawler crane lifted planks and miscellaneous material to the roof, and a circular saw set up on the roof itself cut the planks to length.

Administration — Operations of the Aberthaw Co. were directed by A. B. MacMillan, chief engineer, who supplied the photographs and data for these notes. Leonard C. Wason is president of the Aberthaw Co., and S. L. MacMillan is vice-president.

Getting Down to DETAILS

[Close-up Shots of Job Methods and Equipment]

METAL JACKETS *(right)* to prevent damage by ice, inclose exposed portions of wood pile clusters forming piers for steel bridge across Missouri River near site of Fort Peck Dam in Montana. Contractor for bridge, Massman Construction Co.

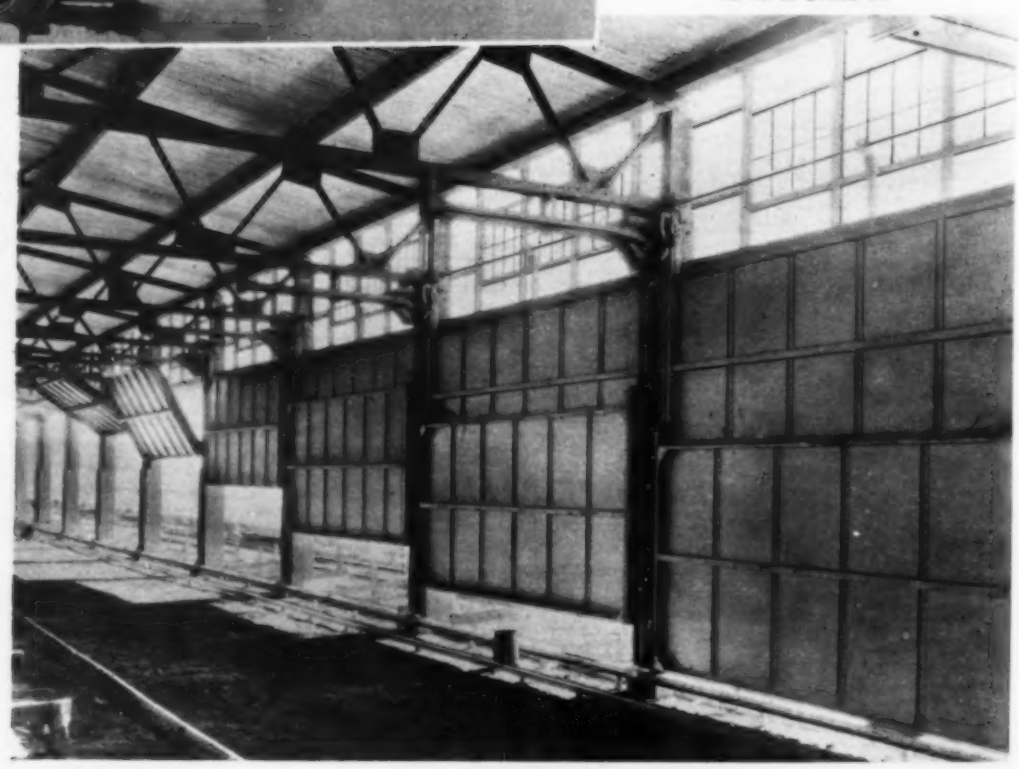
Photo, Harris-Ewing

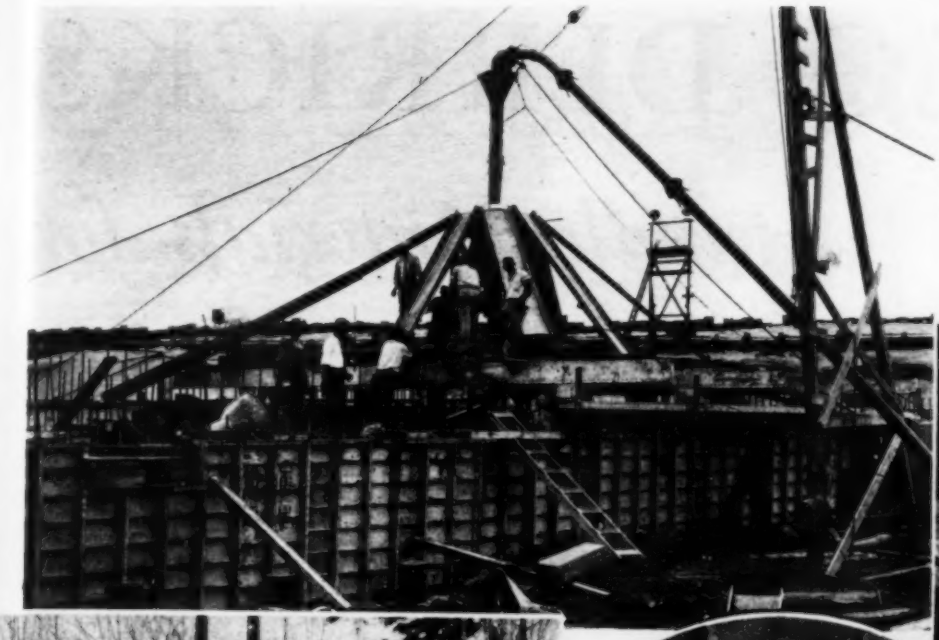
GRAPPLES on crawler cranes rip up track on Connecticut Ave., Washington, D. C., as preliminary to substitution of buses for cars of Capital Transit Co.

COAL HOD EXTENSION *(left)* on end of 14-yd. special body of Mack truck equipped with Wood hydraulic dual telescopic hoists, enables load to be dumped in center of grizzly feeding crushing and aggregate plant of Three Companies Inc., on Colorado River aqueduct in California.

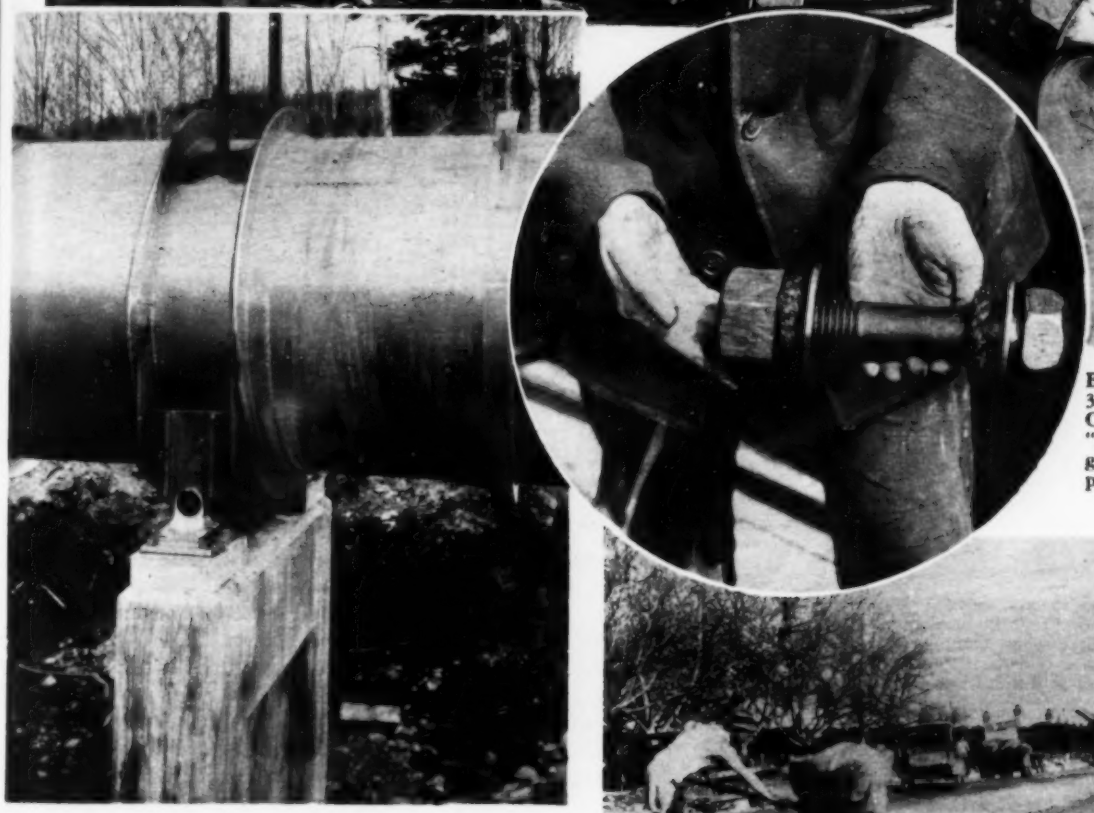
BIFOLDING DOORS *(below)*, consisting of two sections each, inclose shed of Pier 88, New York City, where French liner "Normandie" docks. Lower section of Kinnear equipment telescopes with upper one and the two sections then slide to overhead position on heavy steel tracks, leaving unobstructed opening. Doors range in size from 18x 18 ft. to 37x18 ft.

SAFETY BELTS are part of protective equipment prescribed for all steel workers on San Francisco - Oakland bridge in California. Rope is made fast to steelwork or, in case of concrete central anchorage, is attached to anchor pins set every few feet.





MULTIPLE CHUTES *(left)* distribute to forms concrete pumped through pipe line by Pumpcrete unit at Lock 9 on upper Mississippi River near Lynxville, Wis. Contract amounting to $1,532,000 handled by W. W. McGee Co., of St. Paul, Minn., under direction of Corps of Engineers, U. S. Army.



BOLT DETAILS on cast-iron segmental lining for 31-ft. diameter Midtown Hudson Tunnel, New York City. Initial tightening *(above)* is done by pneumatic "mule." Waterproofing of bolt is accomplished by grommets *(in circle, left)* of loose woven hemp, impregnated with mixture of Dutch Boy red lead, white lead and linseed oil.

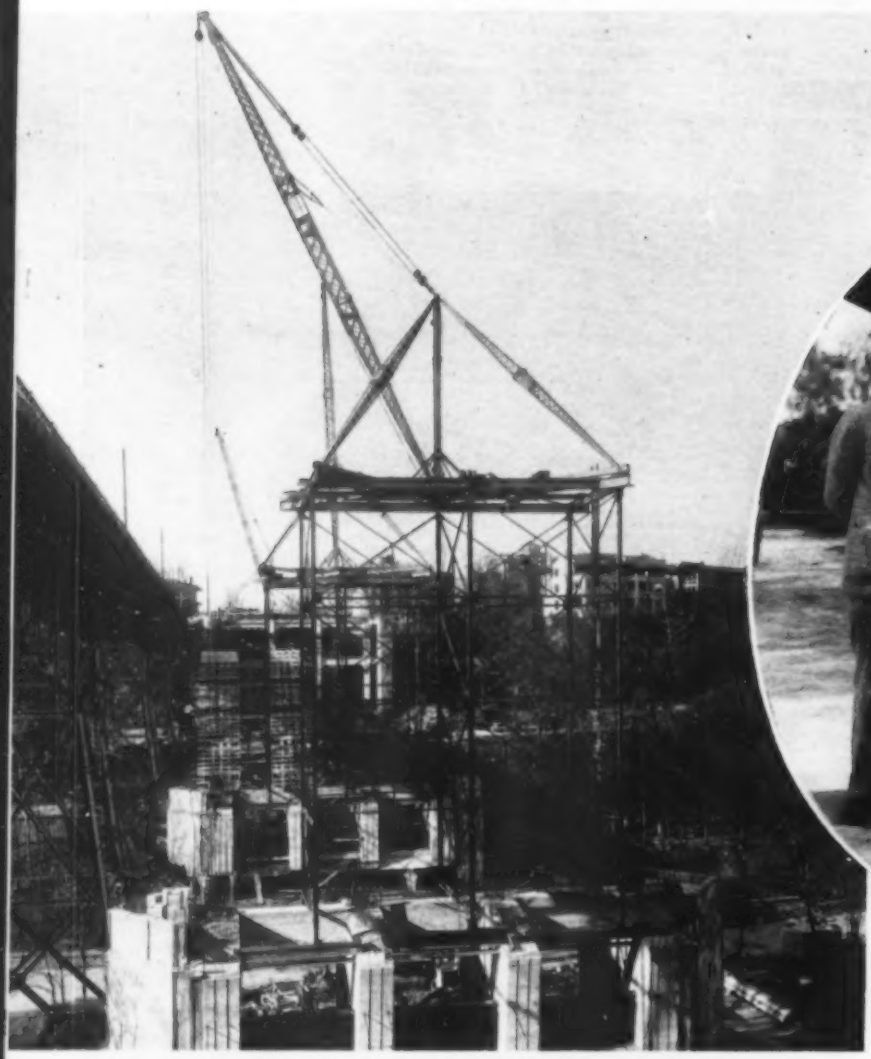
ROCKER SUPPORT on concrete pier carries new 52-63-in. electrically welded steel pipe line for water supply of Tacoma, Wash. Pipe was fabricated and joined by Lincoln shielded-arc equipment.

HEAVY LONGITUDINAL FLOAT constructed by contractor and operated by two men is used in finishing 30-ft. concrete pavement near Los Angeles, Calif.

TIMBER AND GRAVEL BREAKS *(left)* along great Miami River protect state highway embankment between Hamilton and Eaton, Ohio, from erosion.

STIFF-LEG DERRICKS

Handle Materials for



STEEL STIFF-LEG DERRICKS erected on six-leg H-column towers above two piers of triple-arch reinforced-concrete bridge across Rock Creek ravine in Washington, D. C., handle concrete, steel and stone for three spans. Only one derrick has been erected on each of two steel towers but second derrick will be added later on each structure. Displaced steel viaduct at left carries traffic during construction of new bridge.

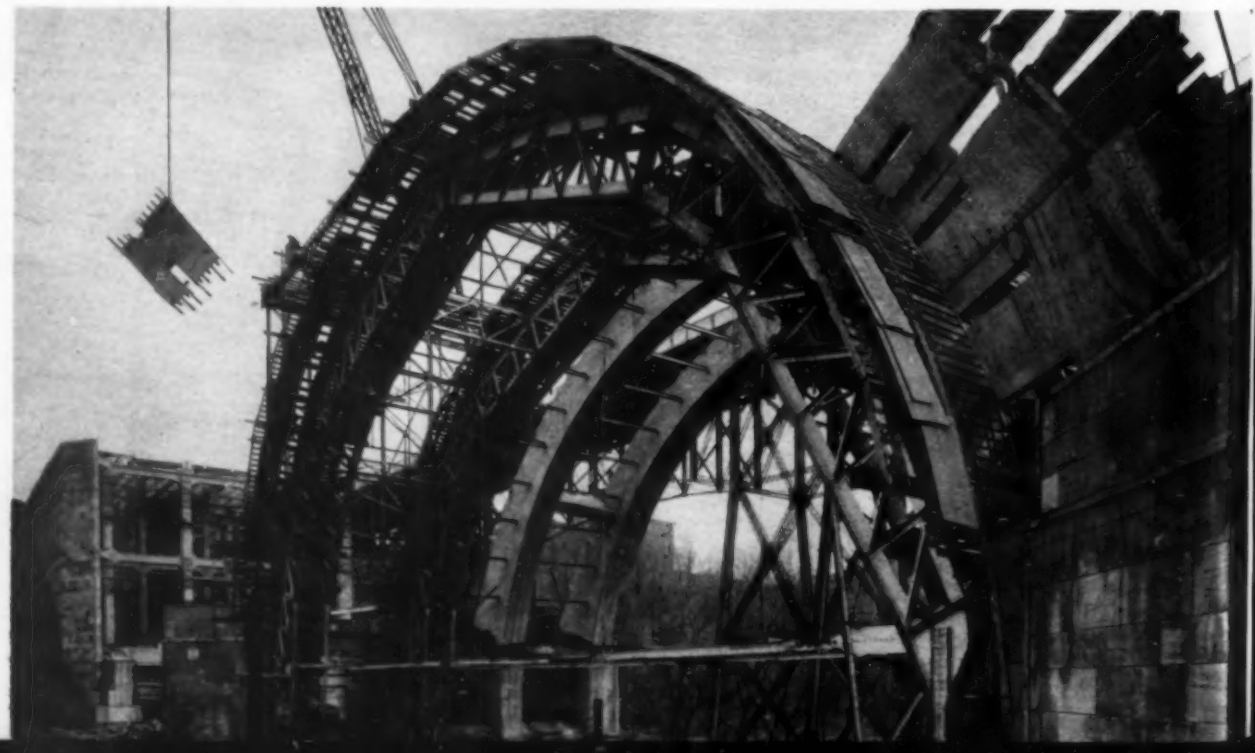
IN CHARGE of construction for John W. Cowper Co., contractor, are Charles B. Vannier (left), superintendent, and George Herman, general superintendent.

TWO pairs of steel stiff-leg derricks erected on temporary H-column towers above the piers and a fifth stiff-leg unit resting on a reinforced-concrete-frame abutment handled concrete, light structural reinforcement, precast ceiling slabs and facing stone of the Calvert St. triple-arch bridge across Rock Creek ravine in Washington, D.C., recently completed by the John W. Cowper Co., of Buffalo, N. Y., and Washington, for the Board of Commissioners of the District of Columbia. Two double sets of steel centers served construction of arch ribs in the three spans. Truck mixers operating from a commercial plant delivered almost 30,000 cu.yd. of concrete required for foundations, reinforced-concrete abutments, arches and deck of the bridge. Design innovations called for precast ceiling slabs between the ribs of the arches and for 1,000 tons of structural steel to support these slabs and to reinforce spandrel columns and deck.

Prior to construction of the present bridge, an existing steel-tower deck-truss structure at the site was moved 80 ft. to the south (as described in *Construction Methods*, Aug. 1934, pp. 26-29) to carry vehicular and street railway traffic until the new bridge was completed. As designed by Modjeski, Masters & Case, the engineers, in cooperation with Paul P. Cret, consulting architect, the new bridge consists of three four-rib semicircular arches of 73-ft. radius, with the crown of the center arch 3-ft. higher than those of the symmetrical side arches.

To give the three spans the appearance of solid barrel arches, precast concrete slabs are suspended from transverse I-beam struts cast in the ribs. Precast slabs are expected to eliminate much of the trouble with disfiguring leaks resulting from the conventional method of casting ceiling slabs in place. Structural reinforcement consisting of I-beam deck stringers supported by vertical open-web members in the spandrel columns was designed to facilitate construction and provide a working platform at deck level. Piers, arch spandrels and abutment walls are faced with Indiana limestone in conformity with the architectural treatment adopted for all bridges in the national capital. These details are shown in accompanying photographs and drawings.

Construction Plant—Consideration of possible plant layouts for building the bridge revealed that stiff-leg derricks from the contractor's equipment stock, mounted on steel towers, would serve the job as efficiently and economically as any method that could be devised. In addition to the Calvert St. approaches, access to the bridge is provided by two lower roadways passing through the west and center arches. Materials delivered on these lower roads could be handled conveniently by derricks set at deck level above the piers. As the structural reinforcement of the bridge had not been designed to support derrick loads, the contractor erected above the piers six-leg H-column towers laced with steel angles, supporting these towers on special I-beam struts cast in



DOUBLE SET OF STEEL CENTERING *(right)* carries forms for two ribs of main arch. Prefabricated panel side forms for arch ribs are notched to permit insertion of steel struts to be embedded in concrete ribs, as indicated by completed ribs on the far side of bridge. These I-beam struts are designed to support precast slabs of arch ceiling.

ON STEEL TOWERS

Concrete Arch Bridge

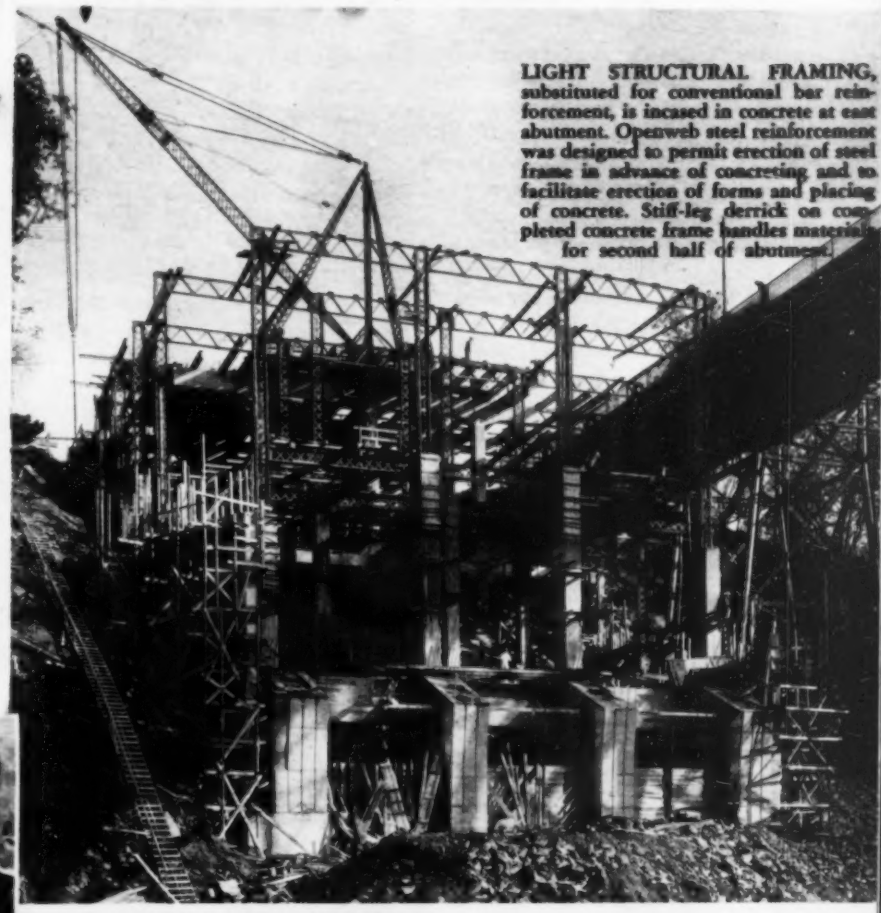
the concrete ribs about 15 ft. above springing line.

On each tower was placed a pair of steel stiff-leg derricks with 100-ft. booms. The derricks were assembled back to back, one facing east and the other west, with the heels of the masts on the center line of the bridge. Hoisting and swinging lines were reeved through sheave blocks to electric hoist engines on the ground. Accompanying photographs and drawings illustrate the general features of the two derrick set-ups. After half of the reinforced-concrete east abutment had been built, the contractor erected a fifth stiff-leg on the finished deck slab to complete the structure. This derrick later was moved to the west abutment to assist construction of the adjacent arch.

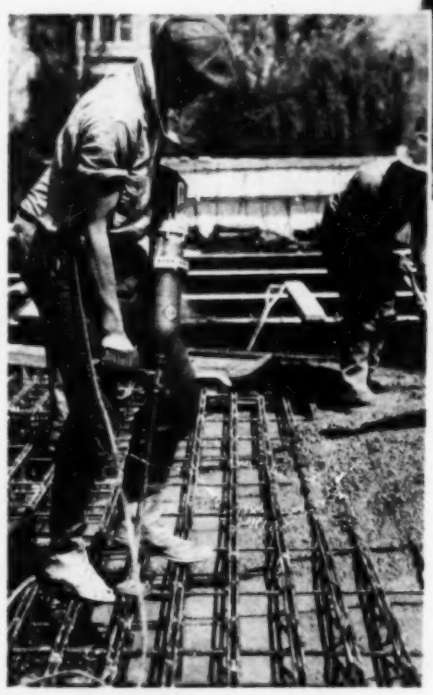
A timber-pile construction bridge was built across Rock Creek, which flows through the east arch, to facilitate movement of equipment and materials and to carry a double set of steel centers when they were moved from the center arch to the east arch.

Pier Concreting—Foundations of the two piers extend to sound rock at El. 32 and El. 13, as shown on the accompanying drawing. Foundation rock for the abutment piers at the two ends of the triple-arch structure was uncovered at slightly higher elevations. The piers are of cellular construction above solid concrete bases about 12 ft. thick. In concreting the pier foundations, the contractor placed as much as 3,000 cu.yd. in six working days, chuting a large part of this volume directly into the footings from truck mixers on the roadways. Footings of the east and west piers, requiring 912 and 817 cu.yd. respectively, were the largest volumes of concrete placed continuously. Four truck mixers at a time could deliver concrete by chutes from Cathedral Ave. to the west pier.

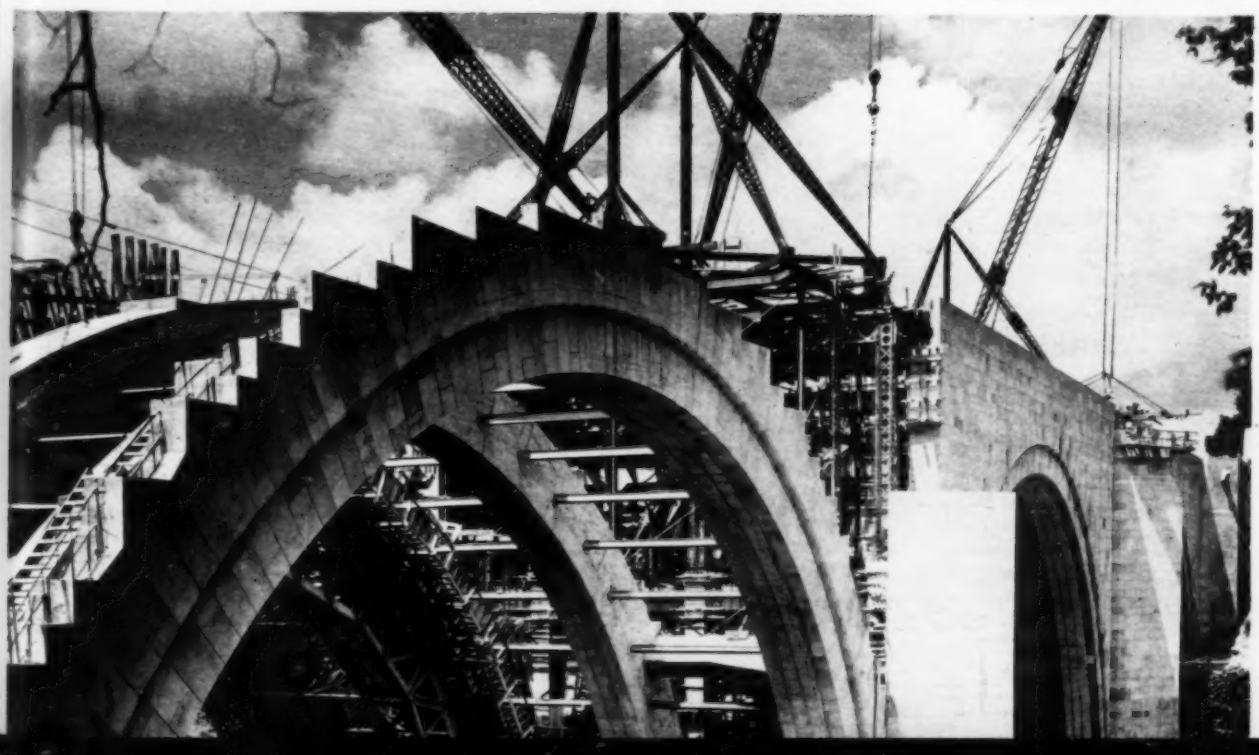
When placing concrete at this rate, a fleet of eighteen or nineteen 3½-yd. Jaeger truck mixers transported the material from a batching plant of the Maloney Concrete Corp., 2 mi. from the job. Specifications required that mixing water be added to the dry batch in the drum at the job and that the batch be mixed, after the addition of the water, for 2 min. Actual observation of truck-mixer operation on the job showed that the mixer drums revolved at an average speed of eleven revolutions per minute instead of the fourteen revolutions upon which the mixing specification had been based. The engineers accordingly increased the mixing period to 2½ to 3 min., as dictated by individual mixer performance.



LIGHT STRUCTURAL FRAMING, substituted for conventional bar reinforcement, is incased in concrete at east abutment. Openweb steel reinforcement was designed to permit erection of steel frame in advance of concreting and to facilitate erection of forms and placing of concrete. Stiff-leg derrick on completed concrete frame handles material for second half of abutment.



ELECTRIC-HAMMER VIBRATOR *(left)* equipped with disk head at lower end of vibrating shaft is used for internal vibration of deck and beam forms.



AFTER COMPLETING FOUR RIBS *(below)* of center arch, double set of steel centering is moved to east arch to construct ribs of this span. Fascia stone of outside rib is set in advance of concreting.

Arch Centers — Two sets of Blaw-Knox steel centering, each set designed to serve simultaneous construction of two parallel arch ribs, were used in building the three arch spans. One set sufficed for the construction of both the center and the east spans, which were full semicircular arches. A second set of steel centering was required for the west arch, which meets the west abutment some distance above the horizontal diameter of a full circle.

Piers were designed as partial abutment piers capable of taking the unbalanced arch thrust of four completed ribs plus the superimposed load of light structural reinforcement, but not of spandrel-column or deck concrete. The contractor, therefore, was free to use the arch centers in any order desired. Arch concreting started with the two south ribs of the west and center spans, and the two sets of centers were moved at about the same time to the north rib of these spans, although the contractor was making no special effort to maintain a balanced loading on the two sides of the west pier. To facilitate movement from the first to the second pair of ribs, the shoes of the arch centers traveled on greased steel cover plates on the I-beam caps of steel bents.

After the set of steel centers in the

center arch had completed construction of the two north ribs, the centers were moved out on greased I-beams to the north of the bridge until they rested on a pair of steel-shod timber cribs. The steel shoes under the timbers were supported by groups of steel rollers on lines of longitudinal steel girders. By means of two sets of blocks and falls rigged from deadmen to the forward ends of the two steel centers, the unit was drawn forward on rollers, as illustrated by accompanying photographs, until it was in position to be moved south over greased I-beams under two ribs of the east arch. With wooden forms in place, a set of steel centers weighed 250 tons.

Arch Ribs — Construction of the forms for the arch ribs, resting on the steel centers, is indicated by an accompanying drawing. Rib soffits and other exposed concrete surfaces were lined with ⅜-in. plywood. Panel forms for the sides of the ribs, notched for insertion of the steel I-beam struts, are shown in several photographs.

Stone facing of the outside ribs was set in advance of concreting. To allow for deflections in the steel centers under the concrete load, the contractor used lead pads in a number of open joints between the stones in each voussoir. A concreting diagram (included in the drawing of the center arch) shows the method of placing concrete in voussoirs to maintain a balanced load on the steel centers. Key blocks between the voussoirs were cast with high-early-strength concrete.

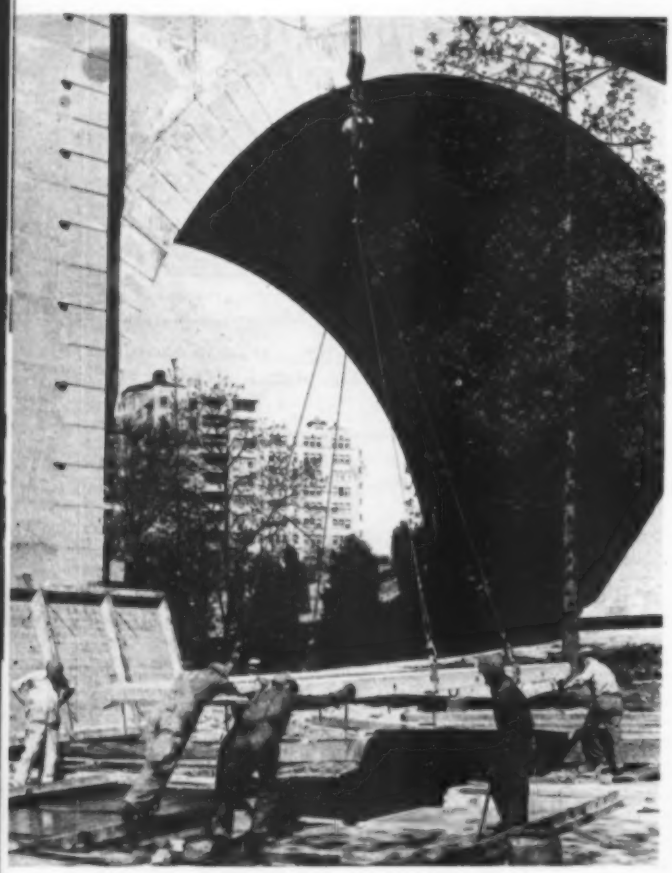
PRECAST CEILING SLABS are suspended from I-beam struts cast in arch ribs.

Two derricks at opposite ends of the arch placed concrete simultaneously in symmetrical voussoirs of a pair of ribs in pours involving total volumes of 190 to 310 cu.yd. The contractor used three Blaw-Knox roller-gate buckets to place this concrete, two buckets being assigned to the derrick in less advantageous position. Depending upon the amount of traffic encountered, concrete was delivered by twelve to fourteen mixers. Handling the concrete in 1-yd. buckets from the lower roadways, two derricks completed the largest rib pours in 8 hr.

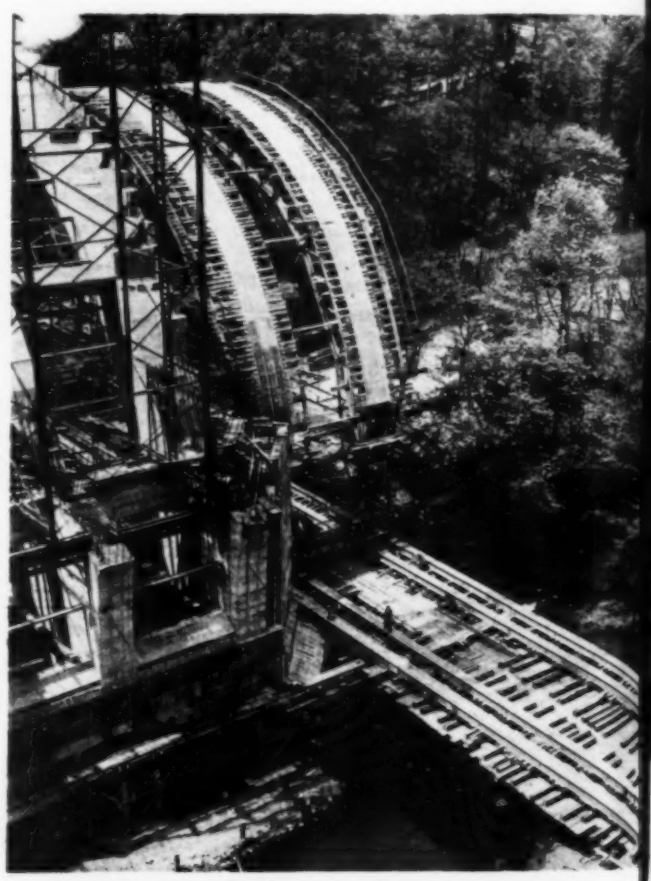
Column and Deck Forms—Conventional wood panel forms were used for the spandrel columns. These forms were anchored to the structural steel cores by ¼-in. rods. Spandrel wall forms were aligned and held in place by wales anchored to the structural steel columns. Deck forms consisted of wood panels supported on joists which in turn were supported by side forms of the roadway stringers. Stringer bottom forms and side forms were carried on wood battens suspended by wire hangers from the steel stringers themselves.

Structural Concrete — For arch ribs and struts, floor beams, walls and columns, the concrete mixture was based on nominal 1:2:4 proportions. In the roadway, sidewalk slabs, ceiling slabs, beam and stringer incasements, the specifications required a richer mixture of nominal 1:2:3 proportions. Column and rib forms were pounded from the outside with hand hammers to bring dense mortar against the surface of the form and avoid honeycomb. Forms for the deck slab, beams and stringers were vibrated, in accordance with specifications, by means of an electric hammer equipped at the end of a vibrating shaft with a special head which could be dropped through the concrete to operate against the inside surface of the forms.

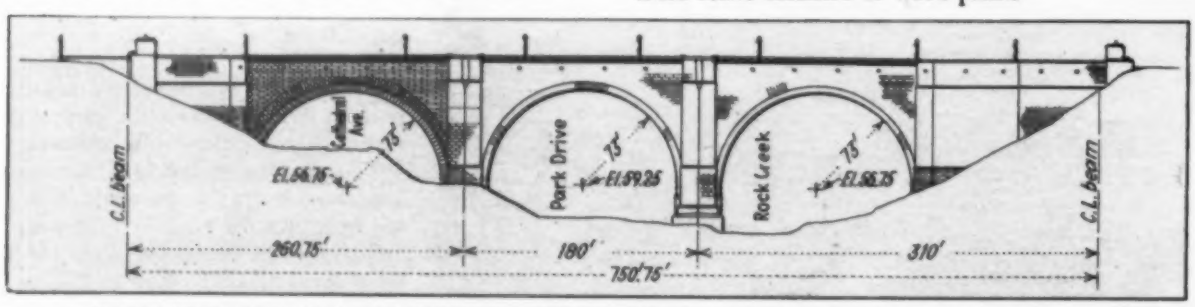
Ceiling Slabs — At a site alongside Cathedral Ave. near the bridge the con-



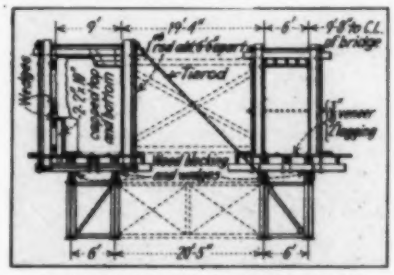
AT CASTING YARD ceiling slabs weighing 5½ tons each are cast upside down to permit giving exposed surface a floated finish. Stiff-leg derrick lifts slab from form by four-point pick-up. U-bolts are embedded in concrete slab.



PAIR OF STEEL CENTERS tied together to form single unit is moved from center arch to east arch on pile trestle across Rock Creek. Each center travels on rollers on two lines of multiple I-beams.



TRIPLE-ARCH REINFORCED-CONCRETE BRIDGE faced with stone and reinforced with light structural framing carries Calvert St. across Rock Creek and two roadways. These lower roadways provide convenient access drives for delivery of construction materials.



CROSS-SECTION OF RIB FORMS on steel centers indicates construction of formwork for inner and outer ribs, with stone fascia ring for latter in position.

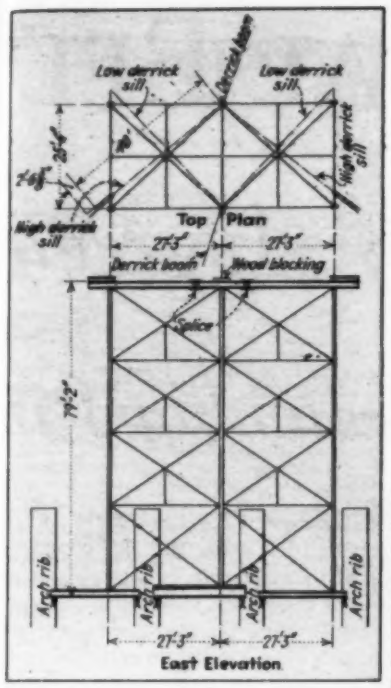
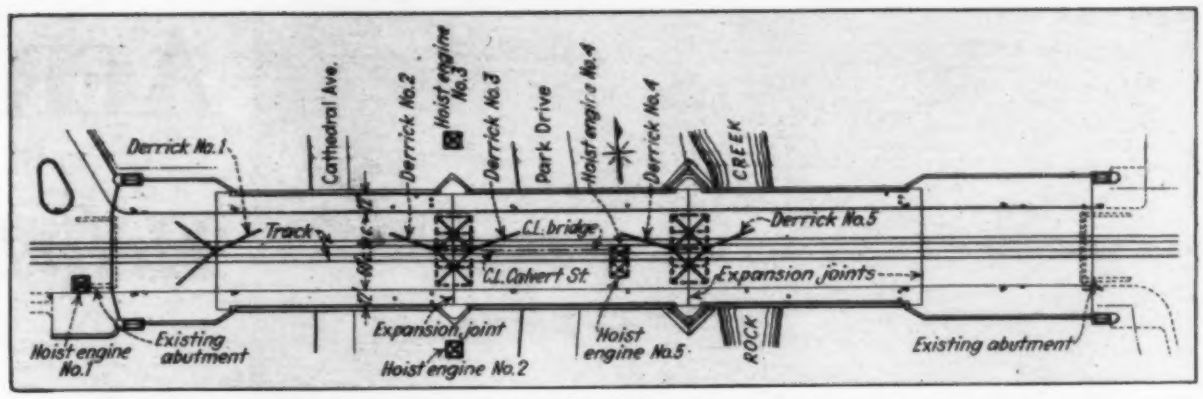
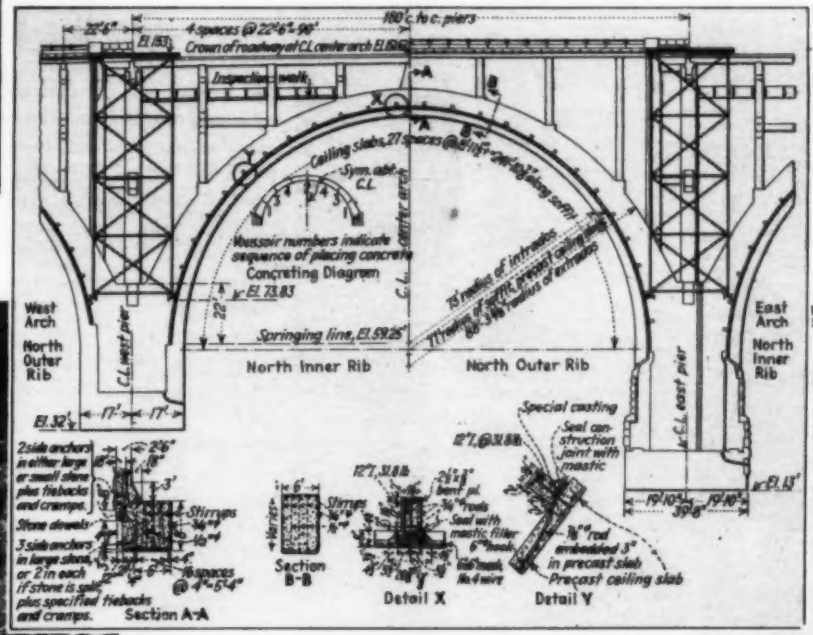


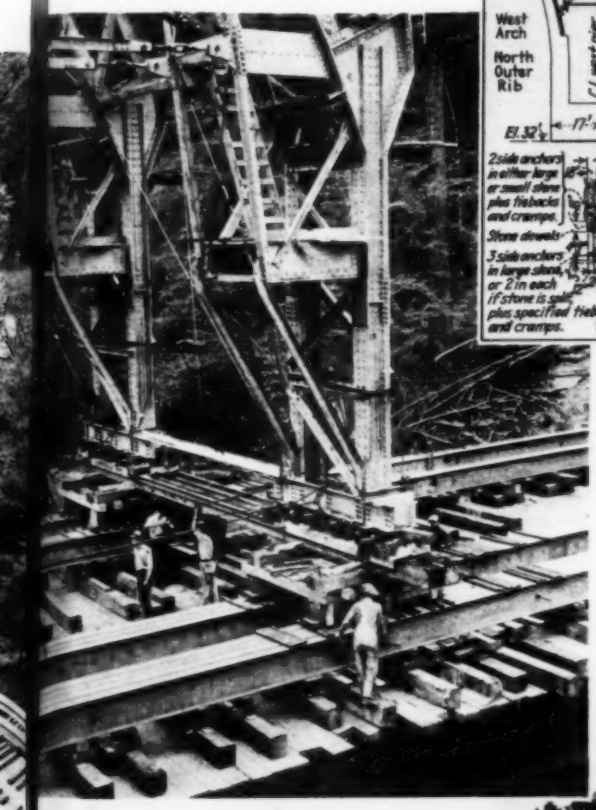
DIAGRAM of temporary H-column tower on west pier indicates design of tower and positions of derricks.



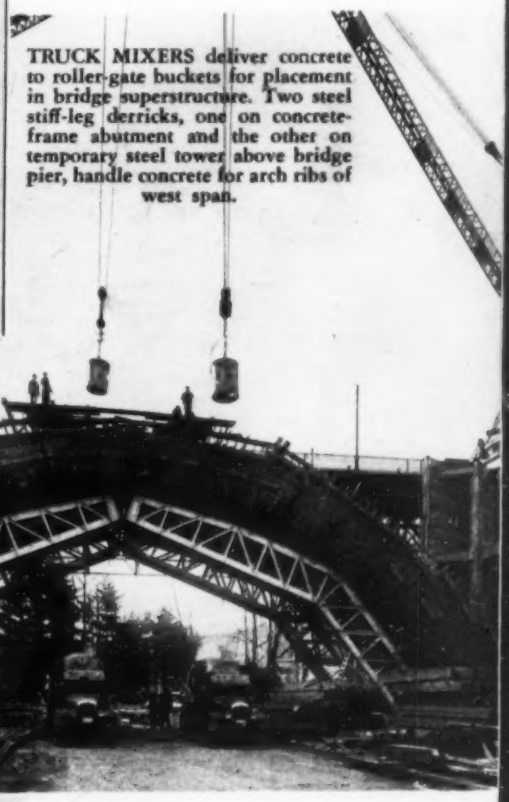
FIVE STIFF-LEG DERRICKS distributed as indicated on two steel towers and on one concrete-frame abutment handle construction materials for three spans of Calvert St. bridge. Electric hoist engines on ground control operation of derricks on steel towers above bridge piers. Derrick No. 1, shown in position on west abutment, was moved to this site after completing construction of east abutment.



SECTIONAL ELEVATION of center arch indicates position of temporary steel towers above bridge piers. Details X and Y show method of attaching precast ceiling slabs to I-beam struts between arch ribs.

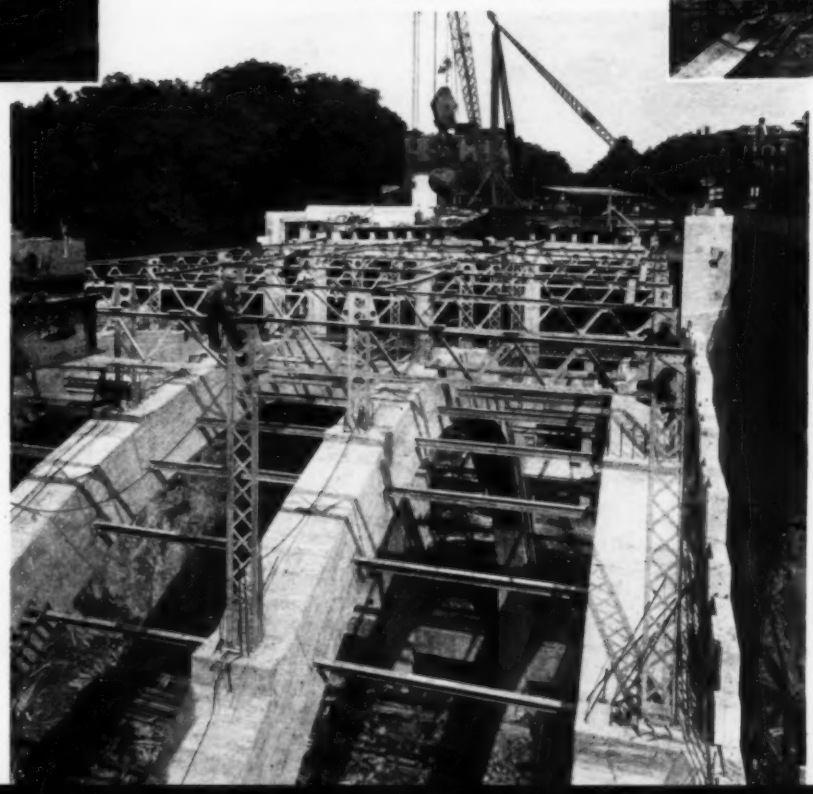


IN TRANSIT *(left)* from center to east arch, forward end of two steel centers rests on steel-shod runners which travel on steel rollers. Two sets of block and tackle attached to end posts of steel centers draw 250-ton unit forward.



TRUCK MIXERS deliver concrete to roller-gate buckets for placement in bridge superstructure. Two steel stiff-leg derricks, one on concrete-frame abutment and the other on temporary steel tower above bridge pier, handle concrete for arch ribs of west span.

LIGHT TRUSS REINFORCEMENT *(below)* for floor beams and spandrel columns is erected on completed ribs.



tractor laid out a yard for manufacturing thirteen ceiling slabs at a time. Each slab measured 19 ft. 4 in. by about 9 ft. in area and weighed 5½ tons. The slabs were cast upside down to permit giving the exposed surface a floated finish. U-bolts installed in the bottoms of the slabs facilitated handling by derrick at the yard and on the bridge. Details X and Y in an accompanying drawing show the method of attaching the precast slabs to the I-beam struts between the arch ribs.

Progress — Construction of the pier footings and abutments began as soon as the old bridge had been moved to its present temporary location, on June 7, 1934. Erection of a steel tower to support stiff-leg derricks above the west pier was started on Oct. 20, 1934. Steel arch centers for the first two ribs of the west span were assembled in position on Nov. 12, 1934, and the centering for the center arch was erected on Nov. 23, 1934. The bridge was opened to two-way traffic on the north half of the roadway Oct. 12, the south half remaining closed for several weeks thereafter to permit demolition of 760 tons of steel in the old structure by two of the stiff-legs mounted as travelers on this half of the bridge.

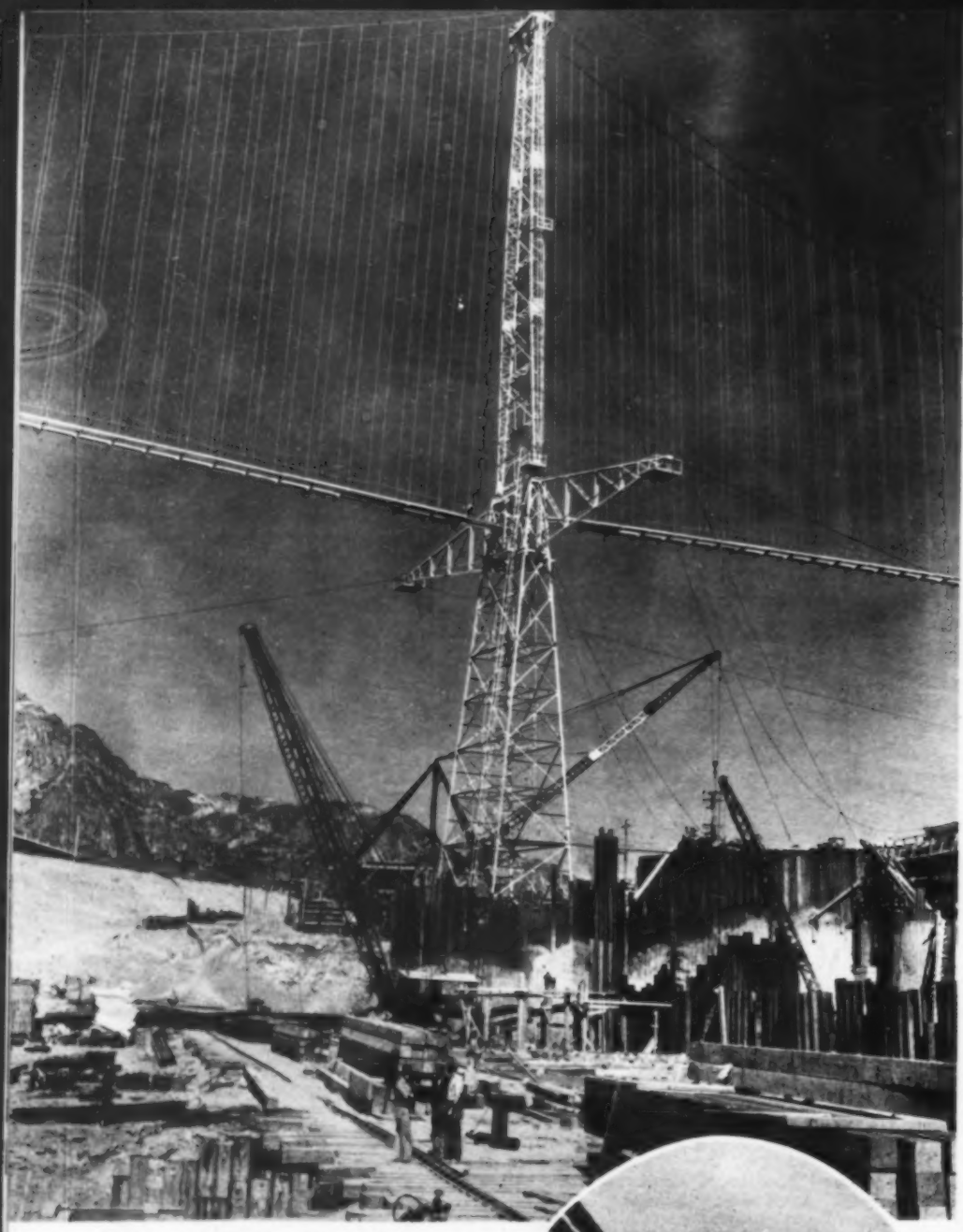
Personnel—For the Board of Commissioners of the District of Columbia, Major John C. Gotwals is engineer commissioner, Capt. H. W. Whitehurst is director of highways, and Clifford R. Whyte is engineer of bridges. Construction of the Calvert St. bridge is supervised directly by A. B. Greene, resident engineer.

Operations of the John W. Cowper Co. of Buffalo and Washington, are carried out under the general supervision of S. K. Pierce, vice-president, with George Herman as general superintendent, Charles B. Vannier as superintendent, and F. H. Martell as assistant superintendent and engineer.

AERIAL BELT

Delivers Aggregate to

Across Columbia River at



CENTRAL TOWER, 325 ft. high, supports cables of twin suspension spans carrying 36-in. belt conveyor for concrete aggregates across Columbia River at elevation 175 ft. above water level.

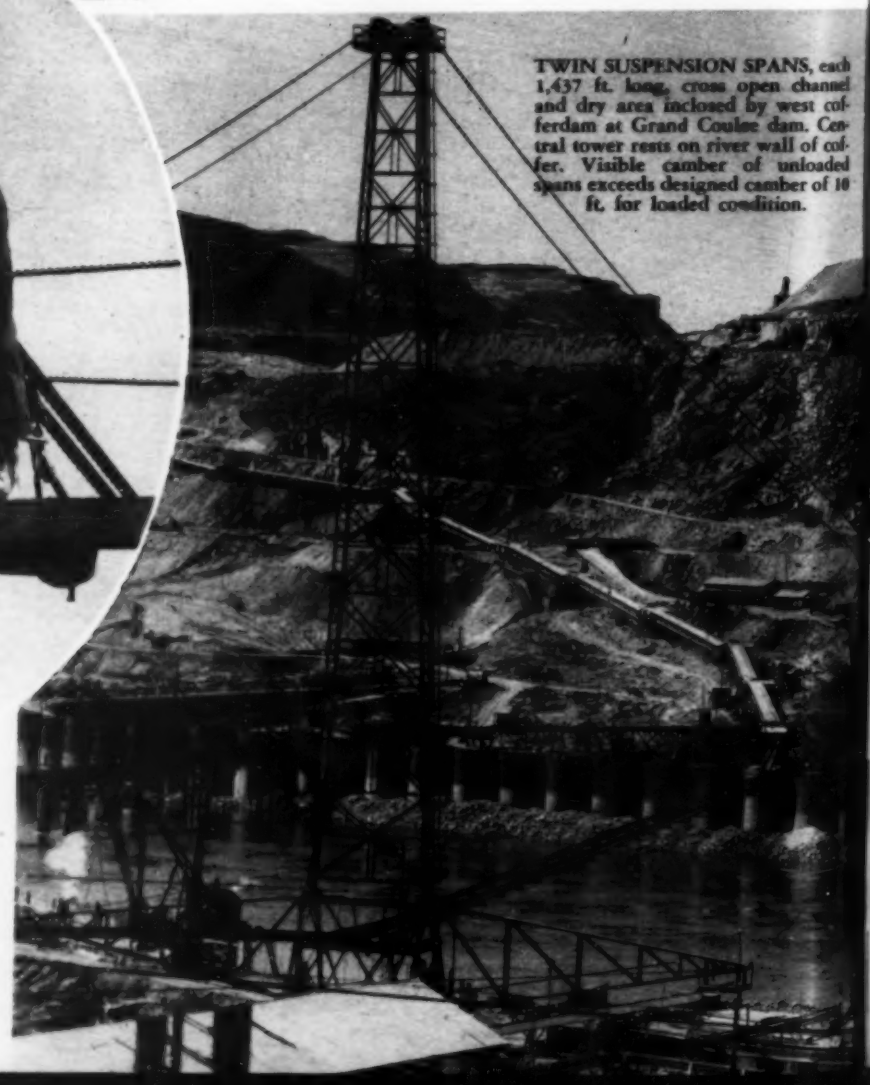
A NETWORK of several miles of belt conveyors at Grand Coulee dam, which converge, cross one another and climb along canyon walls, recently has been supplemented by an "aerial" conveyor that spans the Columbia River about 200 ft. above the bottom of the excavation. This latest addition, supported on a suspension bridge of two 1,437-ft. spans, is to deliver aggregate from storage piles on the east side of the river to the west concrete mixing plant whence concrete goes into the foundation area unwatered behind the west cofferdam. The volume of concrete to be placed in the dam under the present contract totals about 4,500,000 cu.yd. For capacity and length of span it is believed that this aerial conveyor constitutes a record. The bridge is designed for a load of 400 lb. per lineal foot, and the capacity of the 36-in.-wide belt conveyor, at 400 ft. per minute, is 700 tons per hour.

Purpose—Aggregate in large quantities—some 4,000,000 tons of it—must be moved across the Columbia River to supply the concrete mixing plant on the west side of the river (the "westmix plant") recently built to provide concrete for the westerly portion of Grand Coulee dam. Aggregate for concrete has been developed in deposits on the east bank of the river, but, as concrete mixing plants are to be on both sides of the stream, delivery to the plant on the west bank calls for transporting the aggregate across the river by some means. Final choice of method of crossing the river, based on economy, speed of operation and convenience in changing from one kind of material to another, was for a conveyor belt.

Dimensions—By locating the central steel tower on the cofferdam it was possible to divide the major crossing into two equal spans of 1,437 ft. These span lengths necessitated tall towers—the one located on the cofferdam has a total height of 325 ft.—and give a spectacular appearance to the finished assembly. The fabricated structures above floor level are designed as rocker towers, 175 ft. high, supported on pins. These pins are carried by structural steel supports whose height varies to suit the profile under the bridge center line. The west approach span is 124 ft. long and the east approach span 510 ft. Anchorages are concrete blocks; the one at the west end of the bridge is secured by steel rods grouted into the granite abutment on which it rests.

Suspension System—Weight economy suggested the use of a pair of cables over each saddle instead of a single line of larger diameter. Thus the spans are made with two pairs of 2¼-in. plow

SUSPENDER ROPE is fastened to one pair of main cables at same time that twin suspender is attached to parallel pair of cables. Location of hanger connection is marked on main cables. Suspenders are hoisted with fittings and floor beams attached.

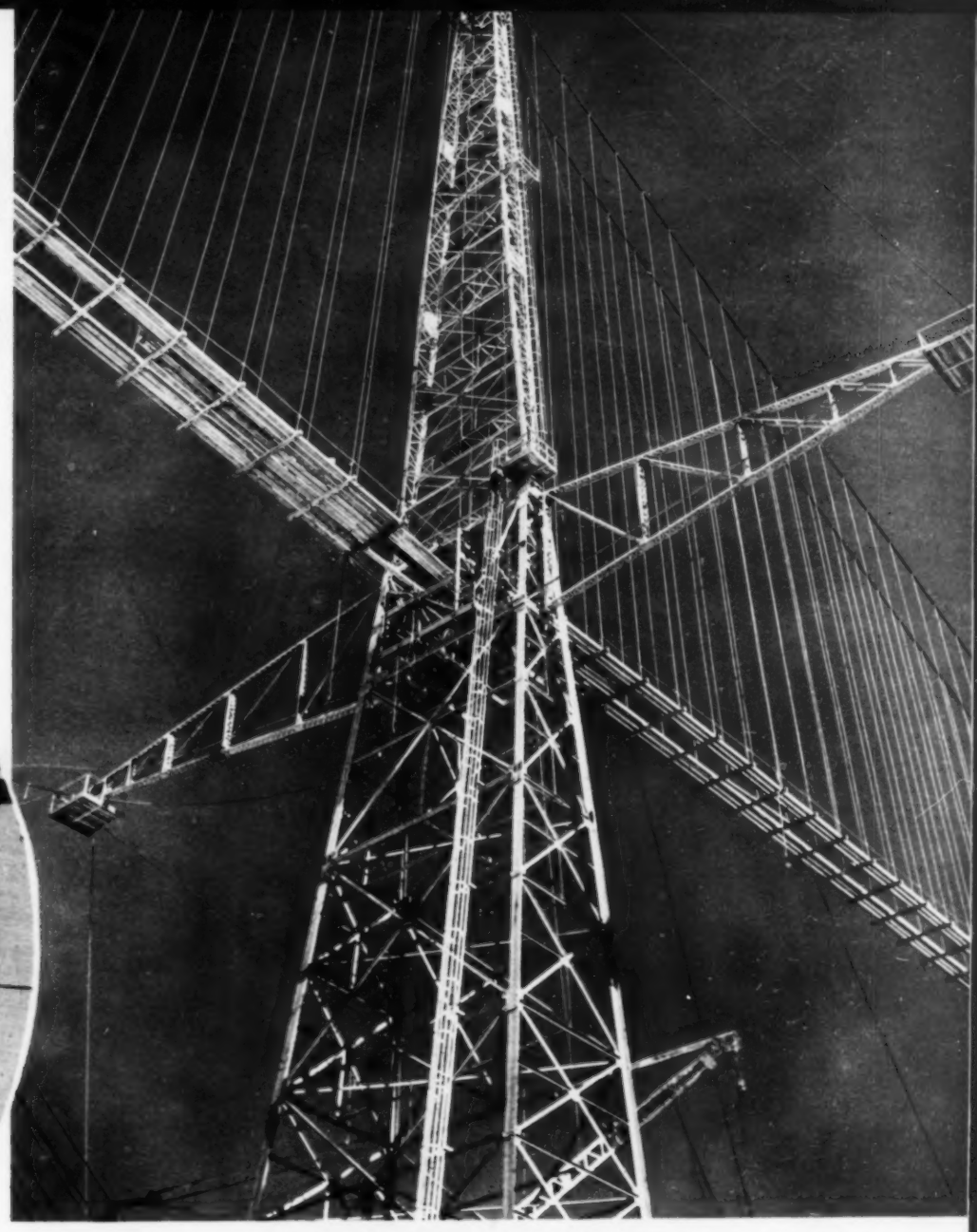


TWIN SUSPENSION SPANS, each 1,437 ft. long, cross open channel and dry area inclosed by west cofferdam at Grand Coulee dam. Central tower rests on river wall of cofer. Visible camber of unloaded spans exceeds designed camber of 10 ft. for loaded condition.

T CONVEYOR

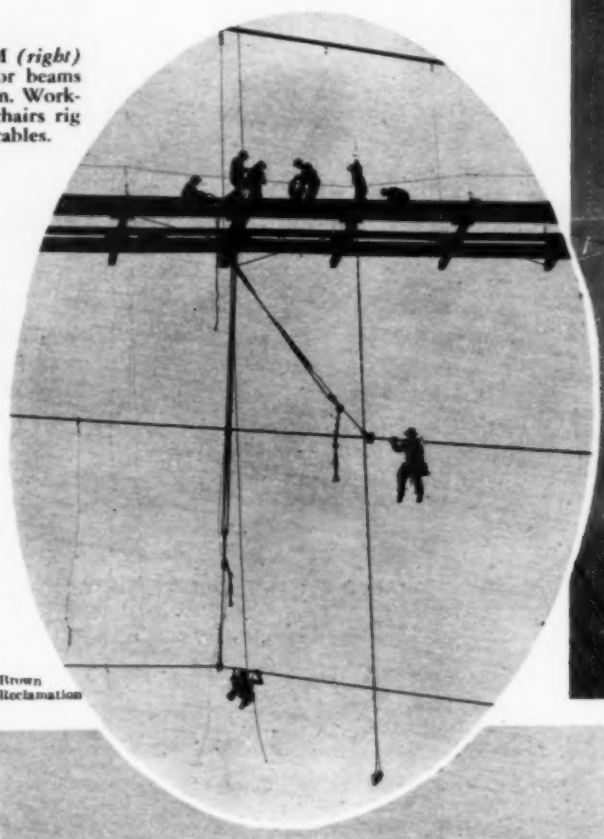
te to Concrete Plant

er at Grand Coulee Dam

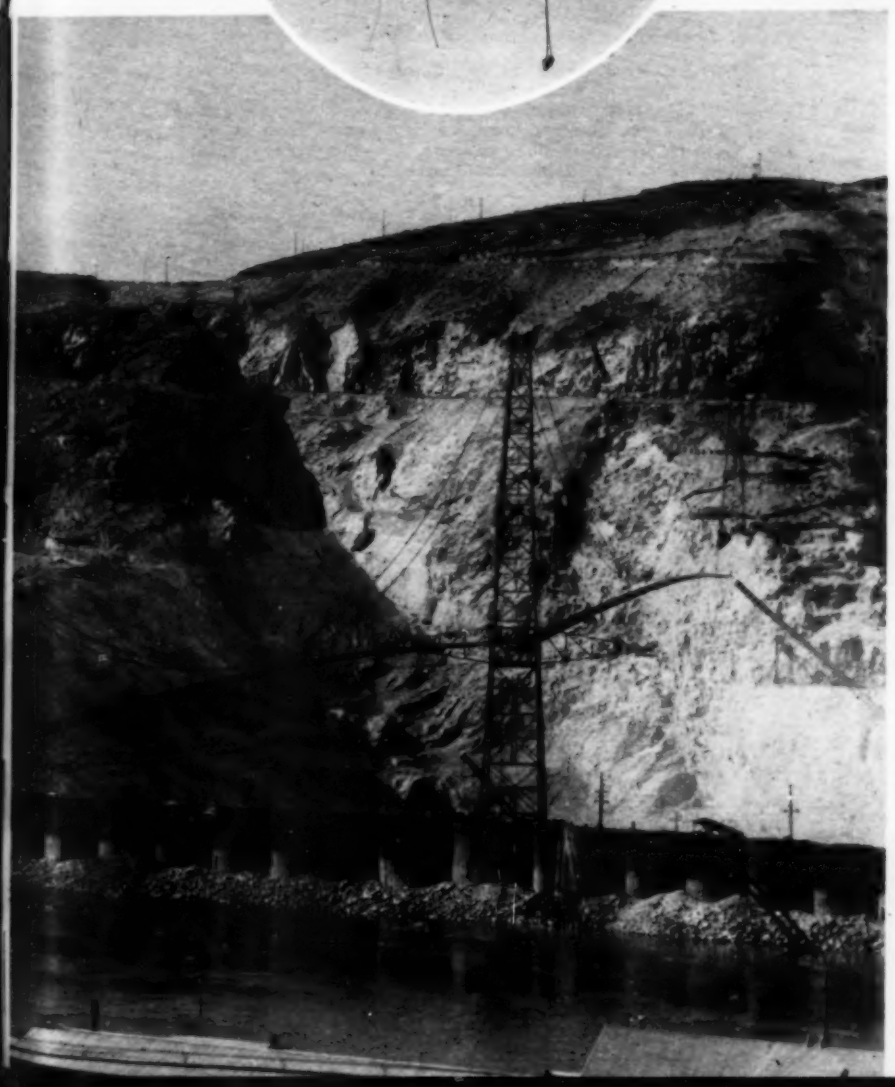


PIVOTED TRUSSED OUTRIGGERS at deck level support windbracing cables roughly parallel with floor system. Wind stays (not yet erected) tie floor beams to windbracing cables. Upper tower structure is pinned to base framing just above outriggers.

FLOOR SYSTEM *(right)* is erected on floor beams of suspended span. Workmen in bo's'n's chairs rig windbracing cables.



Photos K. S. Brown
U. S. Bureau of Reclamation



steel cables from which suspenders are hung every 10 ft. Each pair of suspenders carries a 6x8-in. floor beam. The plan of construction was to hoist as a unit a pair of suspenders with floor beam attached. Erection of the suspension structure was simplified by marking cables at the factory to indicate the location of each connection.

After the main cables had been placed, workmen advanced along them from the tops of the towers and successively fastened the suspender cables, which were hoisted by hand from below. The two suspenders constituting each pair were fastened simultaneously to the main cables. As the cross beams had been attached to the suspenders before they were raised, stringers for the floor could be thrown into place as soon as the suspender connections to the main cables were made. Thus the floor system advanced rapidly from each side, and construction progress was speedy.

Transverse spacing between main cable pairs at the tower tops is 10 ft., equal to the bridge floor width, which allows space for a walkway on either side of the centrally located 36-in. troughing conveyor. The floor system in each span has a sliding joint to take up changes in length. Changes in length of the conveyor belt resulting from variation in loadings and consequent different sags are compensated by gravity take-ups.

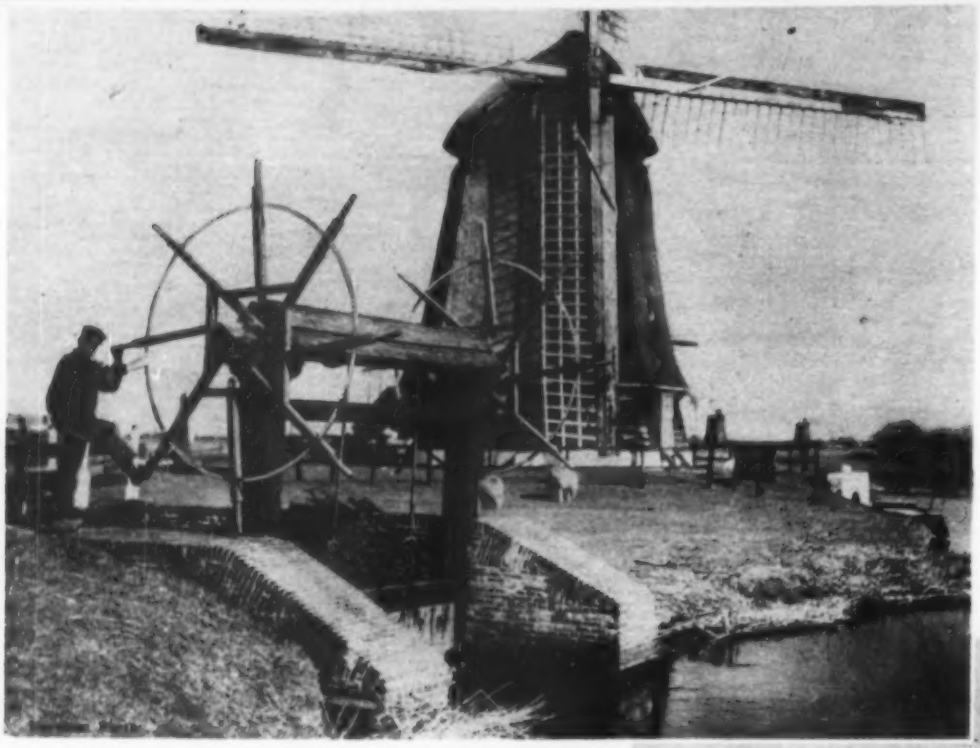
Windbracing—Each span was designed for a camber of 10 ft. under full load. Pivoted outriggers were placed on each of the towers to get the desired spread in the windbracing cables, 1⅝ in. in diameter, which are tied to the bridge floor system by transverse stay ropes to each floor beam. The wind stays fasten into a clip angle or fin bolted to the under side of the floor beam. A turnbuckle is provided in each stay to adjust the tension. The wind bracing systems terminate in a separate anchorage on the west end of the bridge but on the east end attach to anchor bolts left projecting for this purpose from the main gravity anchorage.

Contractors—The general contract for the suspension bridge was held by the Columbia Steel Co.; design and manufacture were by the American Steel & Wire Co. Erection was carried out by the Mason-Walsh-Atkinson-Kier Co., under direction of H. L. Myer, general manager.

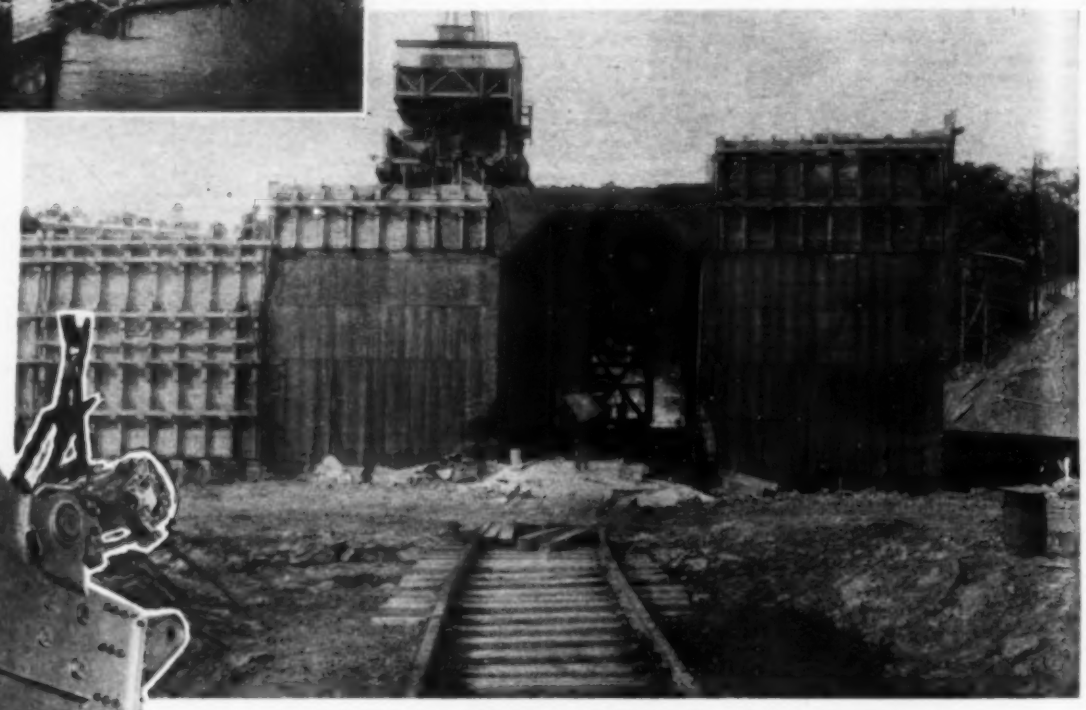
JOB ODDITIES

A Monthly Page of

Unusual Features of Construction

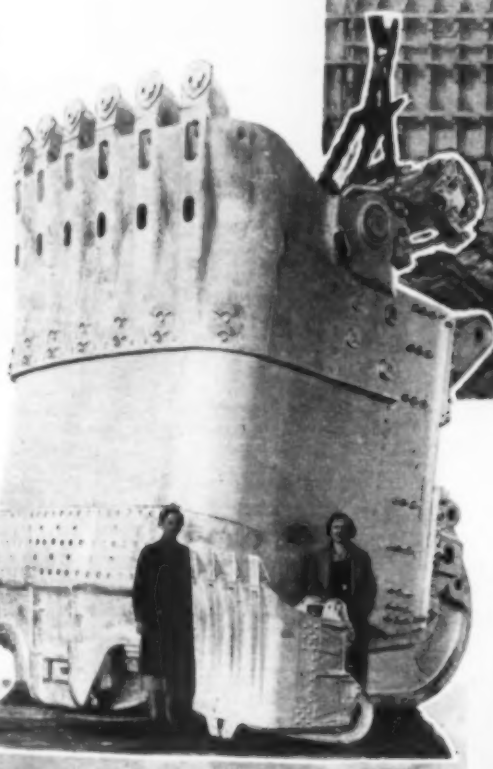


UNIQUE CRANK WHEEL on timber windlass raises sluice gate to drain excess water from polder canal in Holland. Two hands and one sock on spokes of wheel are sufficient to lift gate, as may be noted.



TEMPORARY RAILROAD TUNNEL through east abutment of Tygart dam, Grafton, W. Va., will serve important B.&O. branch line until $3,000,000 relocation job takes railroad out of Tygart River valley. Frederick Snare Corp., of New York City, is building dam; Guthrie, Marsch, Walker Co., of Chicago, holds contract for railroad relocation.

32 CU.YD. *(right)* at one bite is level-full capacity of Marion's newest dipper for coal stripping in Illinois field. Built of lightweight metal alloy, new dipper can be handled by same shovel which formerly used old 20-yd. record-breaking bucket. Latest mammoth looms above ¾-yd. dipper resting beside it.



NATURE FOLLOWS ENGINEERS' RECOMMENDATIONS *(below)*. Chenango River flood at Binghamton, N. Y., cuts into bank at left, taking away part of Front St. pavement and enlarging cross-section practically to that recommended in report of Corps of Engineers, U. S. Army, in 1930, following survey of streams in this area.

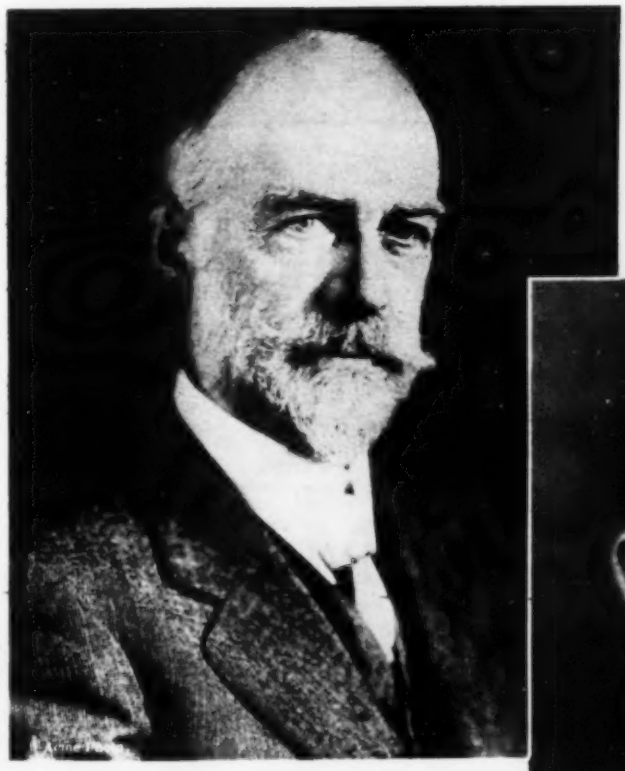
BELLS OF VARIED TONE will be installed in bridge towers and central anchorage of twin suspension spans of west bay crossing of San Francisco-Oakland bridge to warn and guide mariners. Even in fogs pilots will be able to determine course as they approach bridge by noting directions from which different bell tones are heard.

Present and Accounted For —

A Page of

PERSONALITIES

§



HIGHEST ENGINEERING HONOR, John Fritz gold medal, is awarded by board representing four American Engineering societies to William Frederick Durand, professor emeritus of mechanical engineering, Stanford University, California. Doctor Durand is chairman of committee appointed by President Roosevelt to review airship design and construction for U. S. Navy.

PWA ENGINEERING DIRECTOR. Capt. Jabez G. Gholston, formerly chief engineer of PWA's Inspection Division, is appointed to new position by Administrator Ickes. Captain Gholston's experience includes service as chief engineer of steamship, petroleum and pipe-lines companies, as railroad construction engineer, and as infantry captain in France.

Associated News Photo

NEW PRESIDENT of American Society of Municipal Engineers, George B. Gascoigne, consulting sanitary engineer, of Cleveland, Ohio, assumes duties of office following recent election at annual meeting in Cincinnati.

CHIEF INSPECTOR FOR PWA *(below)*. George P. Stowitts is appointed chief engineer of Inspection Division of PWA, succeeding Captain Gholston, whose photograph appears elsewhere on this page. Before joining PWA, Mr. Stowitts, acted successively as engineer of design and engineer of construction for $41,000,000 railroad terminal at Cincinnati.

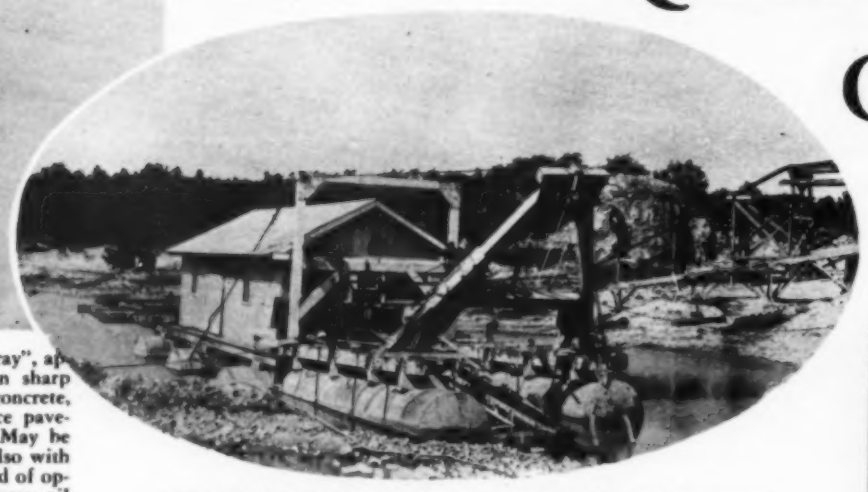
WISCONSIN HIGHWAY ENGINEER *(below)*. E. L. Roettiger is state highway engineer for Wisconsin Highway Commission, succeeding in this office E. E. Parker, deceased.

HEADS ACTIVITIES of Western Society of Engineers. Frank F. Fowle, new president of society, makes inspection trip with other members to view work of U. S. Engineers in building locks and dams on Upper Mississippi.

Harris & Ewing

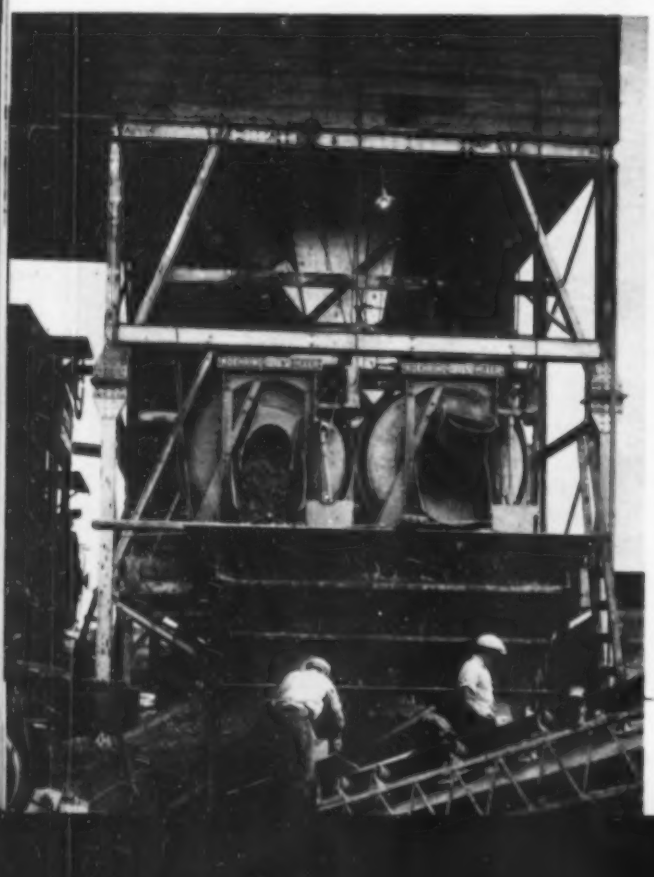
NEW EQUIPMENT ON THE JOB

SEMI-TRAILER BOTTOM DUMP WAGON *(right)* 4-cu. yd. capacity, may be attached to any standard light truck without reinforcement by mounting swivel bolster on rear end of truck frame. Doors are controlled by clutch on shaft which derives power through chain and sprocket connection with rear axle. Clutch for dumping and closing manipulated by tag lines to driver's cab.—Insley Mfg. Co., Indianapolis, Ind.



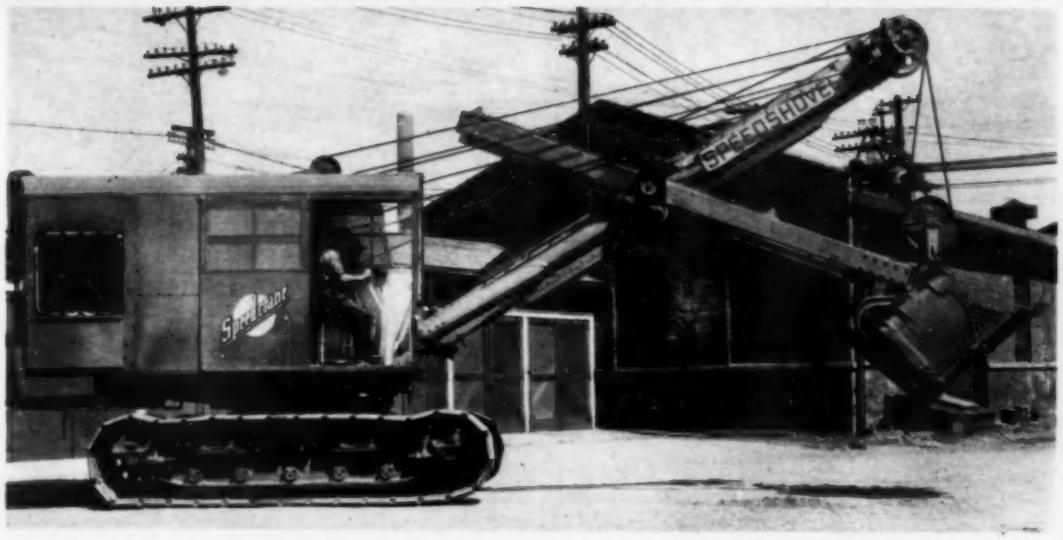
TRAFFIC LINE SPRAY, called "Traf-O-Spray", applies paint under pressure producing clean sharp traffic line on brick, granite, wood block, concrete, black top or any other kind of hard-surface pavement, in spite of irregularities or cracks. May be adjusted for lines 4 to 8 in. in width, and also with regard to amount of paint and walking speed of operator. Handles all kinds of lacquers and heavy oil paints. Self-contained unit provides necessary air. All spraying controlled from motorcycle type handle. Air-operated valve shuts paint off instantly. Holds 5 gal. Maximum operating pressure, 40 lb. Powered by 3 hp. gas engine and equipped with combination gasoline-driven air compressor.—Littleford Bros., Cincinnati, Ohio.

DREDGING PUMP, for heads up to 100 ft., is designed for general dredging of all classes of material from silt and marl to coarse gravel and boulders. For resisting abrasion all parts are made extra heavy and all shocks and friction are reduced to minimum by correct design of passageways through impeller and volute. Can be dismantled readily for renewals and repairs, no special tools being needed. Furnished either for belt drive or with extended sub-base for direct connection to electric motor or diesel or gasoline engines. Lawrence Machine and Pump Corp., 371 Market St., Lawrence, Mass.

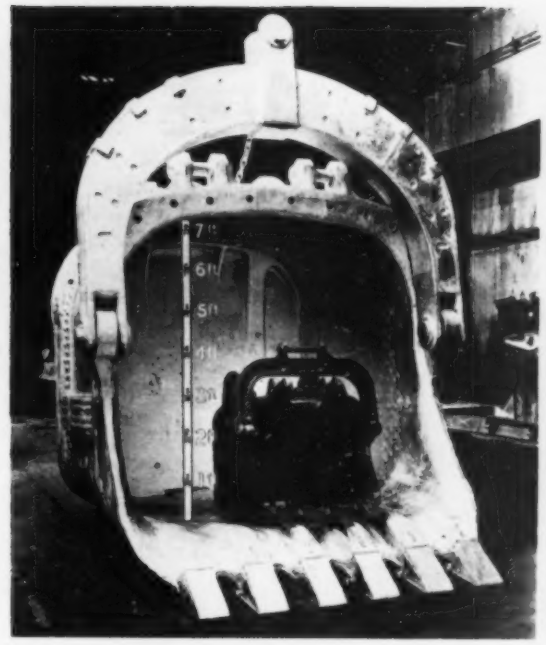


HEAVY-DUTY CONSTRUCTION MIXERS *(left)* for large volume concrete jobs have drums 26, 30 and 32 in. in diameter and can be mounted in batteries of two or more without any mechanical changes. Main feature is flow-line discharge by means of which each bucket load within drum is transferred without spilling into extra wide, rounded and tilted discharge chute. Wide drum discharge opening and chute permit wider than ordinary flow area. Chute power-operated with manual and automatic control. Concrete slides smoothly and quickly, eliminating long drops and sharp breaks in flow direction. Mix texture not disturbed, abrasive wear reduced to minimum and discharge time substantially decreased. Self-contained water tank, wear-resisting chute and fast-flow batch hopper are other features.—Koehring Co., Milwaukee, Wisconsin.

SPIRAL SHAPED NAIL for use in placing asphalt roll roofings comprises a relatively small, sharply pointed shank with a quadruple thread over its entire length and a large thin flat head. This nail, when used to fasten asphalt roofing to wood sheathing underneath, provides maximum efficiency in holding power and in sealing against leakage, unlike ordinary nail *(left above)* which in time becomes loose ultimately causing a leaky roof. Flexible head of malleable material compresses roofing snugly around shank making a weather-proof fastening. Nail rotates under hammer blow easily and without friction and holds even when subjected to expanding and contracting strains of changeable weather.—W. H. Maze Co., Peru, Ill.



SPEED SHOVEL, dragline and crane, of 1-and 2-cu.yd. capacities, embodies following new features: (1) Simplicity of design requires smaller number of working parts, allowing for ample room in cab; (2) All gears and working parts are fully inclosed and operate in filtered oil circulated under pressure by means of oil pump; (3) All motor controls extended to operator's station permitting quick and complete control of power plant without leaving station; (4) Equipped with accelerator control giving variable speed to motor; (5) Swing lock automatically locks rotating bed of machine when not in motion; (6) Crawler lock locks both crawlers in either forward or backward movement; (7) New style disk swing and reversing clutches will operate for years without refacing; (8) Power takeoff provides two operating speeds enabling speed of operations to be reduced 20 per cent below regular speed when necessary.—Manitowoc Engineering Works, Manitowoc, Wis.



COMPOSITE TYPE power-shovel dipper, weighing less than half ordinary solid all-cast type, is fabricated by employing aluminum alloy and high-tensile rolled steel for parts not subjected to heaviest abrasion. Above is shown a 15-cu.yd. dipper which replaces a 12-yd. solid dipper, 3-yd. added capacity being completely offset by lighter proportional weight of new bucket. This composite dipper weighs 32,940 lb. as compared with 74,000 lb., weight of 15-yd. dipper of solid type. These dippers are especially economical in cases where plate- or cast-steel unit affords sufficient structural strength. — American Manganese Steel Co., Chicago Heights, Ill.

VAPORIZING LIQUID FIRE EXTINGUISHER *(above)* of 2-qt. capacity is discharged by air pressure and delivers fan-shaped spray as well as solid stream. Ruggedly constructed of copper and brass. Top and bottom castings are securely fastened to inner and outer seamless shell. Inner shell holds air under pressure and outer one holds fire extinguishing liquid. Weight, 16½ lb.; height, 18 in.; diameter, 5 in. Operated by opening valve on top of extinguisher and controlling combination discharge nozzle. Air-pressure operation, flexible discharge hose and control nozzle permit operator to work efficiently in congested places and to devote full attention to directing stream where most needed.—Pyrene Mfg. Co., 560 Belmont Ave., Newark, N.J.

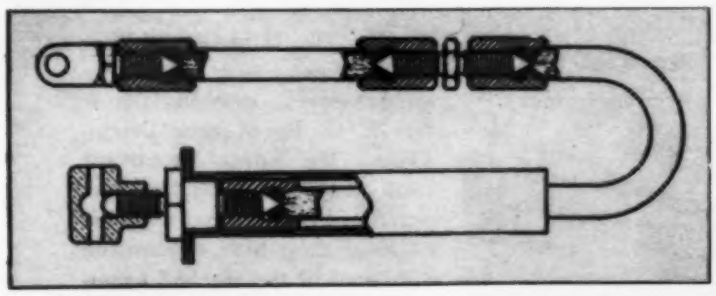
COMPLETE AUTOMATIC VARIABLE SPEED CONTROL *(in oval and at left)* for use in connection with portable compressors is said to result in lower operating and maintenance costs, as engine and compressor do exact amount of work required. This control permits speed of engine and compressor to be regulated automatically by load or demand for air at given time. As air tools are added to or taken off compressor line, speed of engine and compressor increases or diminishes as case may be. Instead of customary cut-out and cut-in control, Chrysler machine "floats" on line and regulates production of exact amount of air needed for given operation at given time.—Amplex Division, Chrysler Corp., Detroit, Mich.

If You Want Further Information—

Within the space limits of this page it is impossible to present complete information about the products illustrated.

The manufacturers, however, will be glad to supply further details if you will write to them.

COMPACT ELECTRIC WELDING UNIT *(below)* consisting of G-E generator and Caterpillar tractor is built for railroad, pipe line and oil field service. Because of its flexibility, short turning and track-type construction it can be driven over rails and steep shoulders and can rest alongside track, clear of traffic, while welding is progressing. Beyond tractor engine flywheel platform has been redesigned to include closed generator and equipment. Generator is 300 amp., 40 v., d.c. type. Operated by power takeoff at rear of tractor through V-belt drive. —Caterpillar Tractor Co., Peoria, Ill.



ELECTRODE HOLDER eliminates poor contacts along path from generator to electrode, thus preventing most frequent cause of "porous welds." Provides positive rod contact, eliminates springs, lever and soldered joints and keeps handle from heating. Welder is able to grasp long fibre handle close to electrode assuring complete control under all conditions. Slight twist with fresh rod releases old stub and another twist in opposite direction places new electrode in jaws of "vise" and welder is ready to strike his arc.—Metalweld, Inc., 26th & Hunting Park Ave., Philadelphia, Pa.

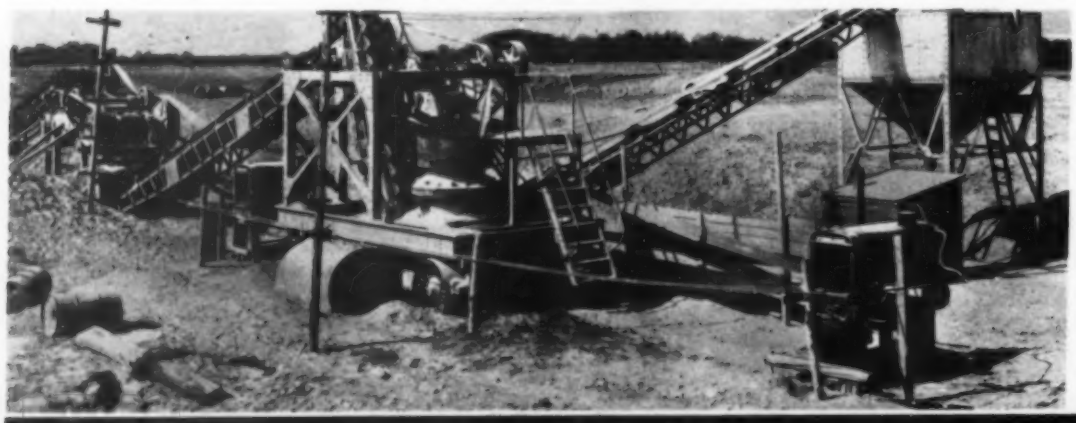
Bring Your Power Problems to International Harvester

International Harvester tractors and power units are first-line equipment on highway construction and maintenance. Here is a wheel-type tractor pulling a big grader.

INTERNATIONAL HARVESTER—largest tractor builder in the world—has been in this industrial power business a good many years. Its engineering, manufacturing, distribution, and service policies are keyed to the needs of industrial power users. If your work calls for crawler tractors, wheel tractors, stationary power units, or power for a variety of mobile equipment, depend on the International Harvester line for the utmost satisfaction in performance and economy. Crawler tractors and power units are available with gasoline or Diesel engines. Let an International branch or industrial distributor work out your power problems. Write us for information.

●

INTERNATIONAL HARVESTER COMPANY
OF AMERICA
(*Incorporated*)
606 S. Michigan Ave. Chicago, Illinois



At left: Two International Harvester Diesel power units operating portable crushing plants for W. C. Burns near Driggs, Idaho. Mr. Burns, prominent road contractor of Idaho Falls, purchased these Diesel units because of their high combustion efficiency in the rarefied mountain air. The elevation at this point is 8000 feet.

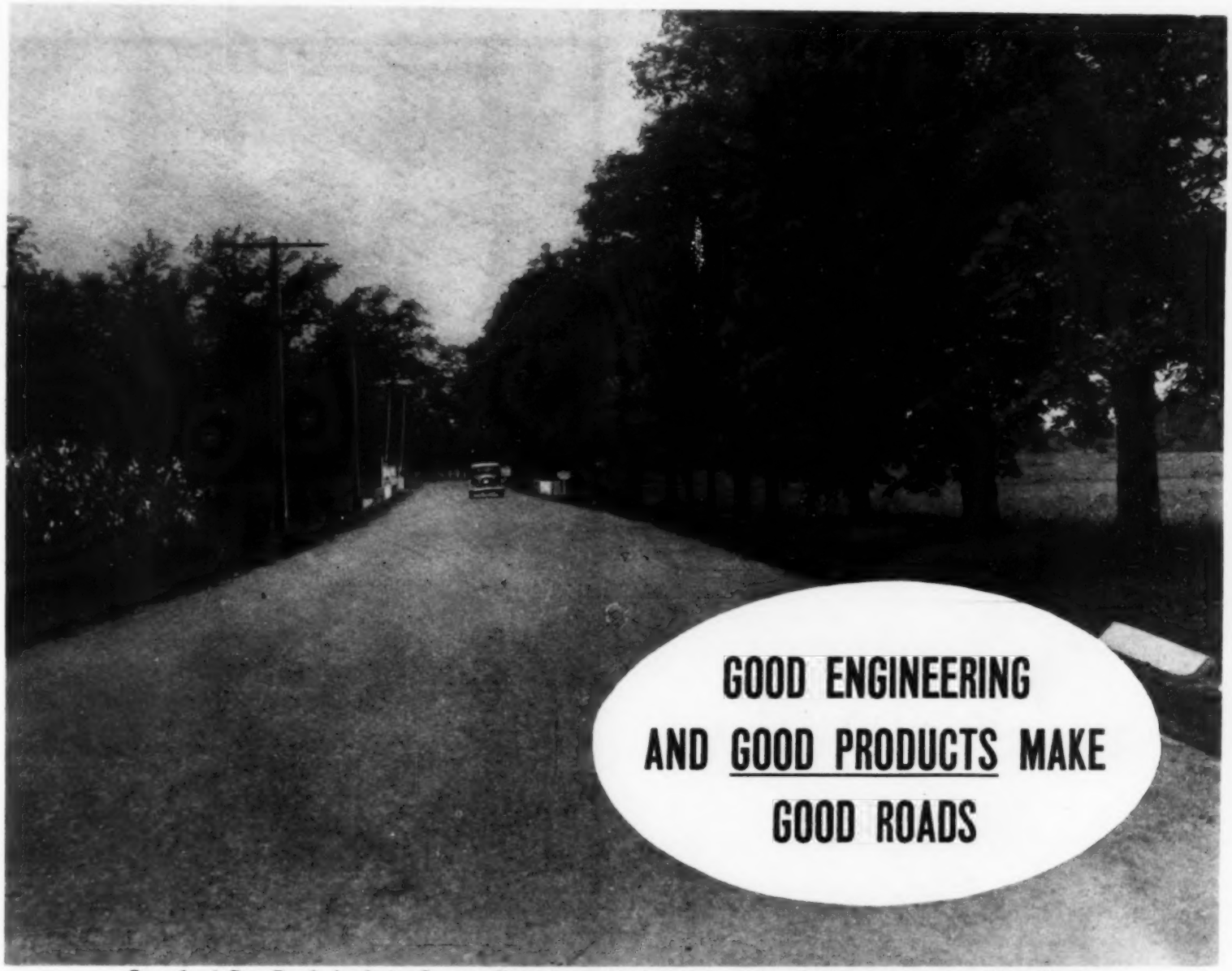
INTERNATIONAL HARVESTER

"Man, how they take it!"

● Crash goes the shale from the big dippers—and how Athey Forged-Trak Two-Ways take it! Round and round they go from shovel to dump, with never a pause, never a delay. Clean, fast dumping to right or left—bigger loads moving constantly—jobs getting done quicker, and at less expense. For all-weather, heavy-duty hauling, nothing can match Athey Forged-Traks—as many a contractor has learned to his profit. Prove it with cold, hard figures on YOUR job.

ATHEY
Forged-Trak

ATHEY TRUSS WHEEL CO.
5631 West 65th Street, Chicago, Ill., Dept. J
Cable Address: "Trusswheel" Chicago



Standard Cut-Back Asphalt, Socony Brand, road mix construction in Albany County, New York

STANDARD BRAND
SOCONY
ASPHALTS
AND
ROAD OILS

Standard Asphalt Road Oils
Standard Asphalt Joint Fillers
Standard Waterproofing Asphalt
Standard Cut-Back Surfacing Asphalt
Standard Asphalt Binder A for surface treatment
Standard Refined Asphalt for sheet asphalt paving
Standard Cold Patch Asphalt for all types of patching
Standard Asphalt Binders B & C for penetration work (Asphalt Macadam)
Standard Paving Asphalt 51-60 and 61-70 Penetration for the mixing method (Asphaltic Concrete)
Standard Asphalt Emulsion for Surface Treatment, Penetration, Road and Plant Mix, and Patching

Specifications and all other particulars furnished on request.

SOCONY-VACUUM OIL CO.
INCORPORATED
STANDARD OIL OF NEW YORK DIVISION

NO TIME WASTED IN NUT TURNING

WITH THE

"FAVORITE"
REVERSIBLE RATCHET WRENCH

Contractors on large engineering projects have found the "FAVORITE" an invaluable tool in the quick turning of nuts. Time is saved because the wrench does not leave the nut until operation is completed. A turn of the pawl and motion is reversed for loosening the nut.

Nut is encompassed on all sides with socket form of head.

Preliminary bolting operations are speeded up with the "FAVORITE." Works on a straight-ahead ratchet movement and can be used in narrower places than an ordinary open-end wrench.

A TIME-SAVER

Each head can turn two different-size nuts, one size on each end.

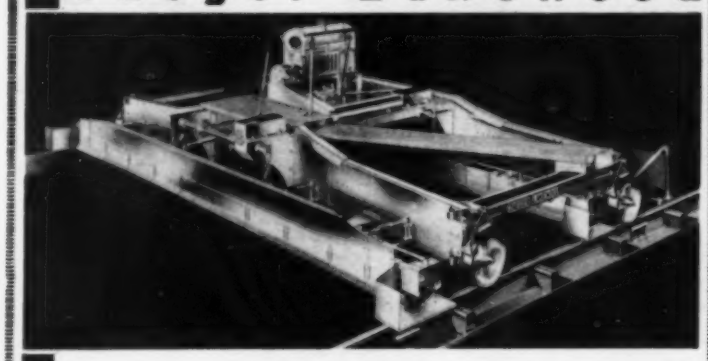
Cadmium finish affords a weather protection.

New metal in Handles, Heads and Pawls makes the "Favorite" stronger for rougher usage.

Send for full particulars.

GREENE, TWEED & CO.
109 Duane Street
New York, N. Y.

Jaeger-Lakewood



Automatic Finisher

for both bituminous and concrete, produces smoother pavements at lower cost because it combines

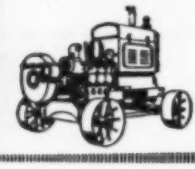
Gas or Gas-Electric

drive with higher speeds, automatic power lift and 12" box-type screeds that operate

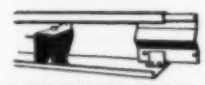
with Velvet Touch

Numerous other improvements. Write for catalog, prices, to The Jaeger Machine Co., 800 Dublin Ave., Columbus, Ohio.

ROAD PUMPS

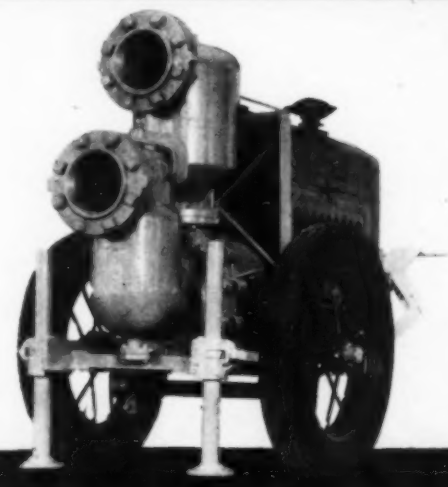


ROAD FORMS



VIBRO-SPREADERS
SUB-GRADERS
GRADE ROOTERS

BRIDGE BUILDER'S MIXERS

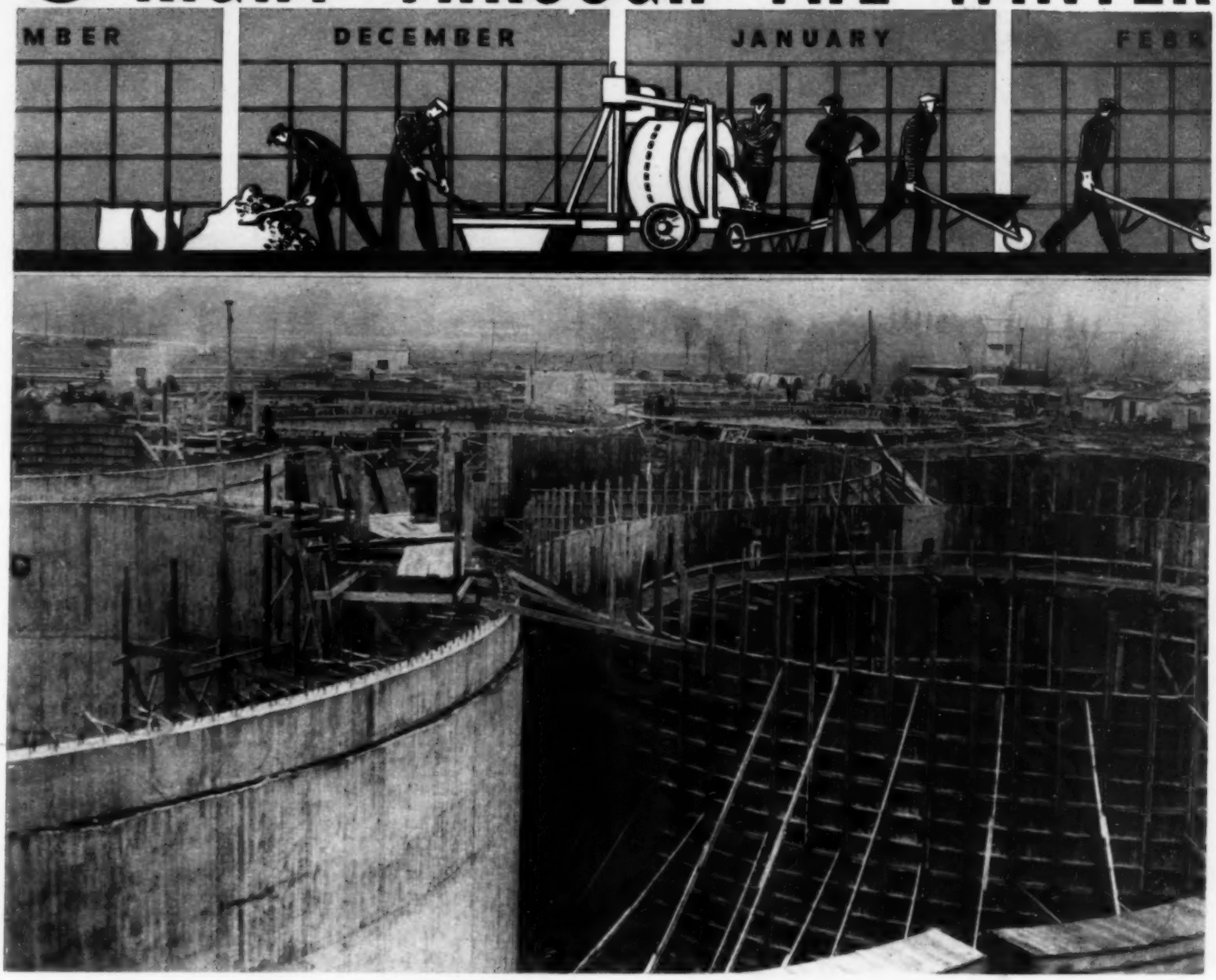


LABOUR PUMPS

Husky strength and maximum simplicity—only one moving part—combine to make LaBour Pumps dependable as the day is long. They're always on the job—which means fewer grey hairs in your head and more dollars in your pocket. Write for complete details.

THE LABOUR COMPANY, INC.
1300 Sterling Avenue
ELKHART, IND

● RIGHT THROUGH THE WINTER



A new sewage treatment plant . . . A PWA all-winter project

CALCIUM CHLORIDE CONCRETE CURING KEEPS CONSTRUCTION GOING AND MEN EMPLOYED

REALIZING the efficiency of maintaining an uninterrupted winter schedule, as well as the necessity of assuring year-round employment for men engaged in the concreting industry, the engineers in charge of the above project have formulated their specifications in an endeavor to obtain concrete of maximum durability regardless of prevailing temperatures.

Many engineers are fully cognizant of the value of Calcium Chloride for winter concreting, and have adopted practices similar to those initiated by numerous state highway organizations, as stated in the following specification:

"In lieu of whatever method of curing that is being used, Calcium Chloride, incorporated in the concrete mix at the rate of 2 lbs./sack of cement, shall be used for curing concrete when the temperature may be expected to reach 50°F. or lower during the 24 hours following the placing of the concrete."

Thus, Calcium Chloride concrete curing is a boon in various directions: (1) Permits opportunities for most welcome winter employment for relief and other labor. (2) Benefits the contractor through earlier job completion, simplified protection measures, and making year-round operating possible. (3) Gives the public the earlier use of more first-class highways and public works. (4) Wins praise for public officials for keeping labor employed and pushing public improvements.

Full information on Calcium Chloride curing should be in every hand directing concrete work. Write for further literature, addressing any member of the

CALCIUM CHLORIDE ASSOCIATION

THE DOW CHEMICAL COMPANY
Midland, Michigan

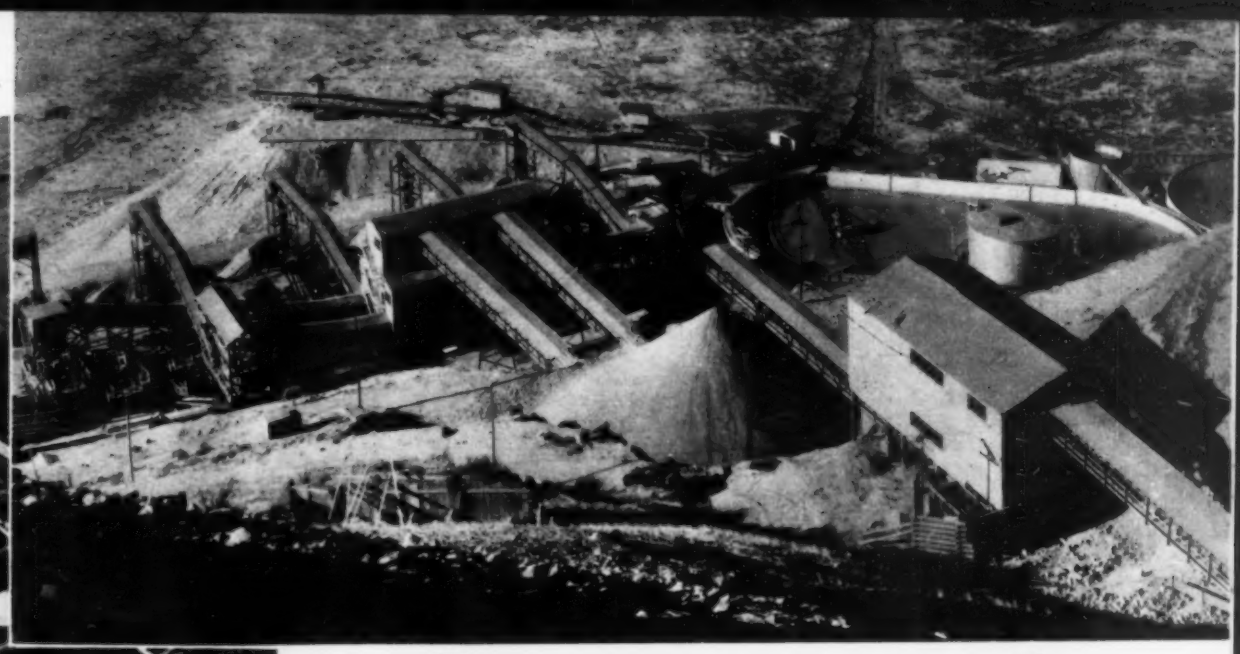
THE COLUMBIA ALKALI CORPORATION
Barberton, Ohio

MICHIGAN ALKALI COMPANY
60 E. 42nd St., New York City

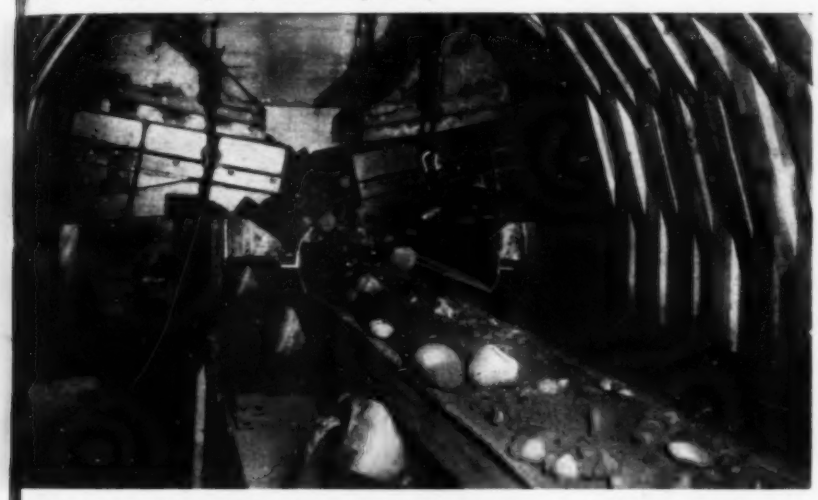
SOLVAY SALES CORPORATION
40 Rector St., New York City

CALCIUM CHLORIDE

FOR COLD-WEATHER CONCRETING



ird's-eye view of the Aggregate Plant at Grand Coulee is shown right-above. Next above he Jeffrey 48-in. Belt Conveyor line connecting the aggregate plant with the main storage s, 3900 ft. apart. Capacity 1200 tons per hour.



o of the eight Jeffrey-Traylor Electric Vibrating Feeders . . buried deep under the huge k piles . . regulating the flow of material to the conveyor belts.

ustration above shows one of the two Radial-Boom Excavating Conveyors. It is crawler ounted at the shovel end . . wheel and track mounted at the other.

Jeffrey Lowers Handling Costs at Grand Coulee Dam...*World's Largest Gravel Plant*

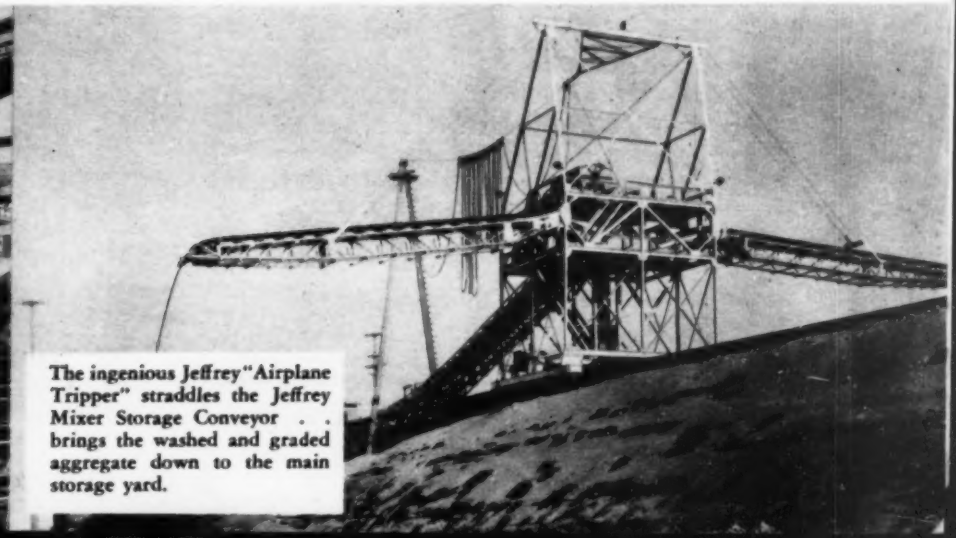
In the design of the aggregate plant for Grand Coulee Dam . . the Contractors and Jeffrey Engineers . . had to figure on equipment for supplying sand and gravel for a 12,000 cu.yds. per day concreting schedule. Equally as important as capacity were dependability and economy.

The success of the Jeffrey Muck Disposal System . . pouring 40 to 50 thousand bank yards per day into Rattlesnake Gulch on the West Side . . recommended Jeffrey Material Handling Equipment for the aggregate plant. In addition to some 43 Conveyors, totaling about 4 miles . . this equipment included 2 Radial-Boom Excavating Conveyors; 8 Electric Vibrating Feeders; 8 Sand Dewatering Drags; 2 Sand Blenders; 4 Small Trippers; an Airplane Tripper and a Waste Material Stacker.

Any or all of these Units can be applied to your conditions to similarily reduce costs. Jeffrey Engineers stand ready . . to work right in your office, in the field—joining with your engineers . . to promptly solve the various material handling problems which confront you. Won't you call on us?

THE JEFFREY MANUFACTURING CO.
937-99 North Fourth Street, Columbus, Ohio
Sales Offices in Principal Cities

Four of the eight Jeffrey Sand Dewatering Drags are shown left-above. These Drags speed the process of separating "fines" from murky "sand soup" and delivers them to the classifier.



The ingenious Jeffrey "Airplane Tripper" straddles the Jeffrey Mixer Storage Conveyor . . brings the washed and graded aggregate down to the main storage yard.

EQUIPMENT and MATERIALS

An index of products made by manufacturers whose advertisements appear in this issue of Construction Methods.

If you do not find all you need in the advertising section, we shall be glad to assist you. Write to —

CONSTRUCTION METHODS
Information Bureau
330 West 42nd St. New York City

ASPHALT
Socony-Vacuum Oil Co., Inc.

ASPHALT PLANTS
Blaw-Knox Company
Hetherington & Berner, Inc.

BACK FILLERS
Northwest Engineering Co.

BARS, IRON AND STEEL
Carnegie-Illinois Steel Corp.
Inland Steel Co.

BATCHERS, ADJUSTABLE MEASURING
Blaw-Knox Company

BATTERIES, STORAGE
Firestone Tire & Rubber Co.

BELTING
Firestone Tire & Rubber Co.
Goodall Rubber Co.

BINS, STORAGE
Blaw-Knox Company
Jeffrey Manufacturing Co.

BLASTING ACCESSORIES
Atlas Powder Co.
Ensign-Bickford Co.

BOLTS, NAILS, NUTS, RIVETS and SPIKES
Carnegie-Illinois Steel Corp.
Inland Steel Co.

BOOTS, RUBBER
Goodall Rubber Co.

BUCKETS
Blaw-Knox Company
Bucyrus-Erie Co.
Insley Mfg. Company
Jeffrey Manufacturing Co.
Link-Belt Co.
Northwest Engineering Co.

BUILDINGS, STEEL
Blaw-Knox Company

BULLDOZERS
Le Tourneau, Inc., R. G.
Roebling Son's Co., J. A.

CABLEWAYS
Roebling Son's Co., J. A.

CABLE, ELECTRIC
General Electric Company
Roebling Son's Co., J. A.

CALCIUM CHLORIDE
Calcium Chloride Assn.

CARBIDE
National Carbide Sales Corp.

CARBIDE LIGHTS
National Carbide Sales Corp.

CARTS, CONCRETE
Ransome Concrete Mchry. Co.

CEMENT
International Cement Corp.
Universal Atlas Cement Co.

CEMENT (BULK) HANDLING EQUIP.
Barber-Greene Co.
Blaw-Knox Company

CHUTES, CONCRETE
Insley Manufacturing Co.

COMPRESSORS, AIR
Allis-Chalmers Mfg. Co.
General Electric Company

CONCRETE CURING MATERIAL
Calcium Chloride Assn.

CONCRETE REINFORCEMENT
Carnegie-Illinois Steel Corp.
Inland Steel Co.
Wickwire Spencer Steel Co.

CONCRETE SLAB RAISING EQUIPMENT
Koehring Company

CONVEYING & STORAGE SYSTEMS
Barber-Greene Co.
Jeffrey Manufacturing Co.
Link Belt Co.

CONVEYORS, BELT, BUCKET & CHAIN
Barber-Greene Co.
Jeffrey Manufacturing Co.
Link Belt Co.
Wickwire Spencer Steel Co.

CRANES, GAS, ELECTRIC, DIESEL & STEAM
American Hoist & Derrick Co.
Bucyrus-Erie Co.
Clyde Sales Co.
Koehring Company
Link Belt Co.
Northwest Engr. Co.
Ransome Concrete Mchry. Co.

CRUSHERS & PULVERIZERS
Acme Road Mchry. Co.
Allis-Chalmers Mfg. Co.
Jeffrey Manufacturing Co.

DERRICKS & DERRICK FITTINGS
American Hoist & Derrick Co.
Clyde Sales Co.

DRAGLINES
(See Cranes & Shovels)

DRAWING PAPER
Wade Instrument Co.

DREDGES
Bucyrus-Erie Co.
Link Belt Co.

DRILLS, WAGON
Bucyrus-Erie Co.

DUMP BODIES, TRUCK
Athey Truss Wheel Co.

DYNAMITE
Atlas Powder Co.

ELEVATORS, BUCKET
Jeffrey Manufacturing Co.
Link Belt Co.

ELEVATORS, CONTR. MATERIAL
Barber-Greene Co.

ENGINES, PORTABLE
Allis-Chalmers Mfg. Co.
Fairbanks, Morse & Co.

ENGINES, STATIONARY, DIESEL & GAS
Caterpillar Tractor Co.
Fairbanks, Morse & Co.

EXCAVATORS, DITCH & TRENCH
American Hoist & Derrick Co.
Barber-Greene Co.
Bucyrus-Erie Co.
Koehring Company.
Link Belt Co.
Northwest Engr. Co.

EXCAVATORS, DRAGLINE
Bucyrus-Erie Co.
Insley Mfg. Company
Koehring Company
Link Belt Co.
Northwest Engr. Co.

EXPLOSIVES
Atlas Powder Co.

FLARE LIGHTS
National Carbide Sales Corp.

FLOODLIGHTS
General Electric Company

FLOOR PLATES, STEEL
Carnegie-Illinois Steel Corp.
Inland Steel Co.

FORMS, CONCRETE
Blaw-Knox Company

FUSE, BLASTING
Atlas Powder Co.
Ensign-Bickford Co.

GENERATORS, ELECTRIC
Electric Tamper & Equip. Co.
Fairbanks, Morse & Co.
General Electric Company

GRADERS, ROAD
Acme Road Mchry. Co.
Allis-Chalmers Mfg. Co.
Blaw-Knox Company
Caterpillar Tractor Co.

GUARD RAILS, HIGHWAY
Wickwire Spencer Steel Co.

HOISTS, GAS, ELECTRIC, DIESEL & STEAM
Allis-Chalmers Mfg. Co.
American Hoist & Derrick Co.
Clyde Sales Co.
Fairbanks, Morse & Co.
Sterling Machinery Corp.

HOISTS, HAND
Sterling Machinery Corp.

HOSE, AIR, WATER & STEAM
Fairbanks, Morse & Co.
Goodall Rubber Co.

JOINTS, PAVING
Flexible Road Joint Machine Co.
Truscon Steel Co.

LATH, EXPANDED METAL
Wickwire Spencer Steel Co.

LIGHTING PLANTS
Fairbanks, Morse & Co.
General Electric Company
Hutchison Engrg. Works
Sterling Machinery Corp.

LIGHTS, CONTRACTORS PORTABLE
National Carbide Sales Corp.

LINER PLATES, STEEL
Blaw-Knox Company

LOADERS, PORTABLE
Barber-Greene Co.
Jeffrey Manufacturing Co.
Link Belt Co.

LOCOMOTIVES
General Electric Company

LUBRICANTS
Gulf Refining Co.
Sinclair Consolidated Oil Corp.
Roebling Son's Co., J. A.

MAINTAINERS, ROAD
Allis-Chalmers Mfg. Co.

MIXERS, CONCRETE & MORTAR
Jaeger Machine Co.
Koehring Company

MIXERS, PAVING
Koehring Company

MIXERS, TRUCK
Blaw-Knox Company
Jaeger Machine Co.

MIXING PLANTS, CENTRAL
Blaw-Knox Company
Jaeger Machine Co.

MOTORS, ELECTRIC
Fairbanks, Morse & Co.
General Electric Company

PAINTS, WATERPROOFING
Sika, Inc.

PAVING, COLD PATCHING
Socony-Vacuum Oil Co., Inc.

PAVING, HAND TOOLS
L & M Mfg. Co.

PILE DRIVERS
American Hoist & Derrick Co.

PILING, INTERLOCKING STEEL
Carnegie-Illinois Steel Corp.
Inland Steel Co.

PIPE INSTALLATION METHODS
Hydranger Corp.

POWDER
Atlas Powder Co.

PUMPS, PORTABLE
Fairbanks, Morse & Co.
Jaeger Machine Co.
La Bour Company
Moretrench Corp.
Sterling Machinery Corp.

PUMPS, STATIONARY
Allis-Chalmers Mfg. Co.
Fairbanks, Morse & Co.
La Bour Company
Sterling Machinery Corp.

RAILS & RAIL JOINTS, FASTENINGS & SPECIALTIES
Carnegie-Illinois Steel Corp.

ROAD OIL & PRESERVATIVES
Socony-Vacuum Oil Co., Inc.

ROAD FINISHERS, CONCRETE
Blaw-Knox Company
Flexible Road Joint Machine Co.

ROAD SURFACING HARROWS
Insley Manufacturing Co.

ROPE, WIRE
American Steel & Wire Co.
Roebling Son's Co., J. A.
Wickwire Spencer Steel Co.

SAW RIGS, PORTABLE
Sterling Machinery Corp.

SCALES, WEIGHING & PROPORTIONING
Fairbanks, Morse & Co.

SCRAPERS, SCARIFIERS & PLOWS
Euclid Road Mchry. Co.

SCREENS, SAND, GRAVEL & COAL
Acme Road Mchry. Co.
Link Belt Co.
Wickwire Spencer Steel Co.

SHEETS, IRON & STEEL
Carnegie-Illinois Steel Corp.

SHOVELS, HAND
Ames Baldwin Wyoming Co.

SHOVELS, POWER
American Hoist & Derrick Co.
Bucyrus-Erie Co.
Insley Manufacturing Co.
Koehring Company.
Link Belt Co.
Northwest Engr. Co.

SPREADERS, BITUMINOUS SURFACE
Barber-Greene Co.
Jaeger Machine Co.

STEEL, STRUCTURAL
Carnegie-Illinois Steel Corp.

TENSION INDICATOR
Martin-Decker Corp.

TIRES, TRUCK
Firestone Tire & Rubber Co.

TRACKS, INDUSTRIAL & PORTABLE
Carnegie-Illinois Steel Corp.

TRACTORS, DIESEL & GAS
Allis-Chalmers Mfg. Co.
Caterpillar Tractor Co.
Cleveland Tractor Co.
International Harvester Co.

TRAILERS, DUMP & CRAWLER WHEEL
Allis-Chalmers Mfg. Co.
Athey Truss Wheel Co.
Austin-Western Road Mchy. Co.
Euclid Road Mchy. Co.
LeTourneau, Inc., R. G.

TRUCKS, MOTOR
Euclid Road Mchy. Co.
Hug Company, The
International Harvester Co.

VENTILATING TUBES
American Brattice Cloth Co.

WAGONS, DUMP & CRAWLER WHEEL
Allis-Chalmers Mfg. Co.
Athey Truss Wheel Co.
Euclid Road Mchy. Co.
Koehring Company
LeTourneau, Inc., R. G.

WATERPROOFING
Sika, Inc.

WELDING & CUTTING APPARS.
General Electric Company

WELDING RODS & WIRE
Roebling Son's Co., J. A.
Wickwire Spencer Steel Co.

WELLPOINT SYSTEMS
Complete Mchry. & Equip. Co., Inc.
Moretrench Corp.

WHEELS, TRACKLAYING TYPE
Athey Truss Wheel Co.

WIRE ROPE ACCESSORIES
Roebling Son's Co., J. A.

WRENCHES
Greene-Tweed & Co.

For page reference see advertisers index, page 70

Construction Methods Service Section

JANUARY 1936 CONSTRUCTION METHODS
will be the Annual Road Builders Number

CONSTRUCTION METHODS ADVERTISERS IN THIS ISSUE

ON A CLASS "B" BUCYRUS DRAGLINE HE GOT 31 WORKING DAYS OUT OF A TRU-LAY PREFORMED WIRE ROPE AS AGAINST 14 WORKING DAYS OUT OF A COMPETITIVE ROPE.

OLIVER J. (NAME ON REQUEST) HAD THE JOB OF MAKING A 400,000 YARD EARTH FILL ON A SEAWALL CONSTRUCTION.

THIS SAVED A LOT OF EXPENSE — NOT ONLY IN RIGGING, REEVING, AND MEN'S TIME, BUT IN THE DRAGLINE'S ACTUAL PRODUCTION. . . . THIS MAN IS VERY ENTHUSIASTIC OVER TRU-LAY PREFORMED WIRE ROPE.

AMERICAN CABLE COMPANY, Inc.
Wilkes-Barre, Pennsylvania
An Associate Company of the American Chain Co., Inc.

•

District Offices: Atlanta • Chicago • Detroit • Denver • New York
Philadelphia • Pittsburgh • Houston • San Francisco

In Business for Your Safety
ACCO

TRU·LAY *Preformed* Wire Rope

FAITH MAY MOVE MOUNTAINS-

BUT CLETRAC DIESEL IS SURER

TACKLING 140,000 cubic yards of rock excavation on a heavy cut and fill job between Albany and Jamestown, Kentucky, the Ralph E. Mills Company of Frankfort, picked Cletrac 80 Diesels as the most powerful tractor available.

On rock and mountain jobs of this type, Cletrac 80 Diesel offers a unique combination of brute strength, ruggedness and sure-footed maneuverability which enables the contractor to bid safely, complete the job and come out with a sure profit.

SEE

Cletrac
Crawler Tractors
Built To Endure

At the Road Show

Don't miss this great exhibit January 20 to 24 inclusive—a modern fair with 5½ acres of equipment in Cleveland's mammoth Public Hall. See all the Cletrac models, with equipment for all road-building, maintenance and contracting purposes.

The Cleveland Tractor Co., Cleveland, Ohi